MINING WORLD

Peace on Earth

Volume 20, Number 13 DECEMBER 1958 50 cents a copy - 3s 6d in sterling

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ENGINEER'S FIELD REPORT

PRODUCT **CHEVRON PRESSURE PRIMER SYSTEM**

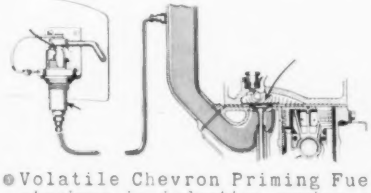
FIRM **JONES-TOMKINS CO.**
Cougar, Washington

Special cartridge fires giant diesel in seconds

At world's highest earth-filled dam construction site near Woodland, Washington, three giant diesel shovels get immediate starts from Chevron Pressure Primer System, reports Jones-Tomkins, general contractors. System helps speed shovel's fill-borrowing operations for this $51,000,000 project. Five-year-old 4500 Manitowoc Speed Crane (above), powered by Caterpillar 350 h.p. V-12 D397 engine, operates 18 hours a day, six days a week, loading 21-yard dump trucks in just 70 seconds. Jones-Tomkins uses Standard fuels and lubricants exclusively on this job.

Chevron Pressure Primer Discharger mounted on instrument panel (left) operates satisfactorily despite heavy vibration, reports shovel foreman Henry Watson (right). "We've had absolutely no trouble with this system. The Chevron Pressure Primer System eliminates dust clogging and allows fluid to reach the cylinders quickly. It's the practical way we've found to get these rigs going."

Why Chevron Pressure Primer System assures fast starts



- Volatile Chevron Priming Fuel atomizes in induction system at all temperatures even at −65°F, no hand-pumping required.
- Pressure or weakest spark from engine fires mixture.
- Simple rugged air-tight discharger prevents Priming Fuel leakage.
- Small, fireproof, pressurized steel cartridges protect Priming Fuel from water and dirt.

For More Information or the name of your nearest distributor, write or call any of the companies listed.

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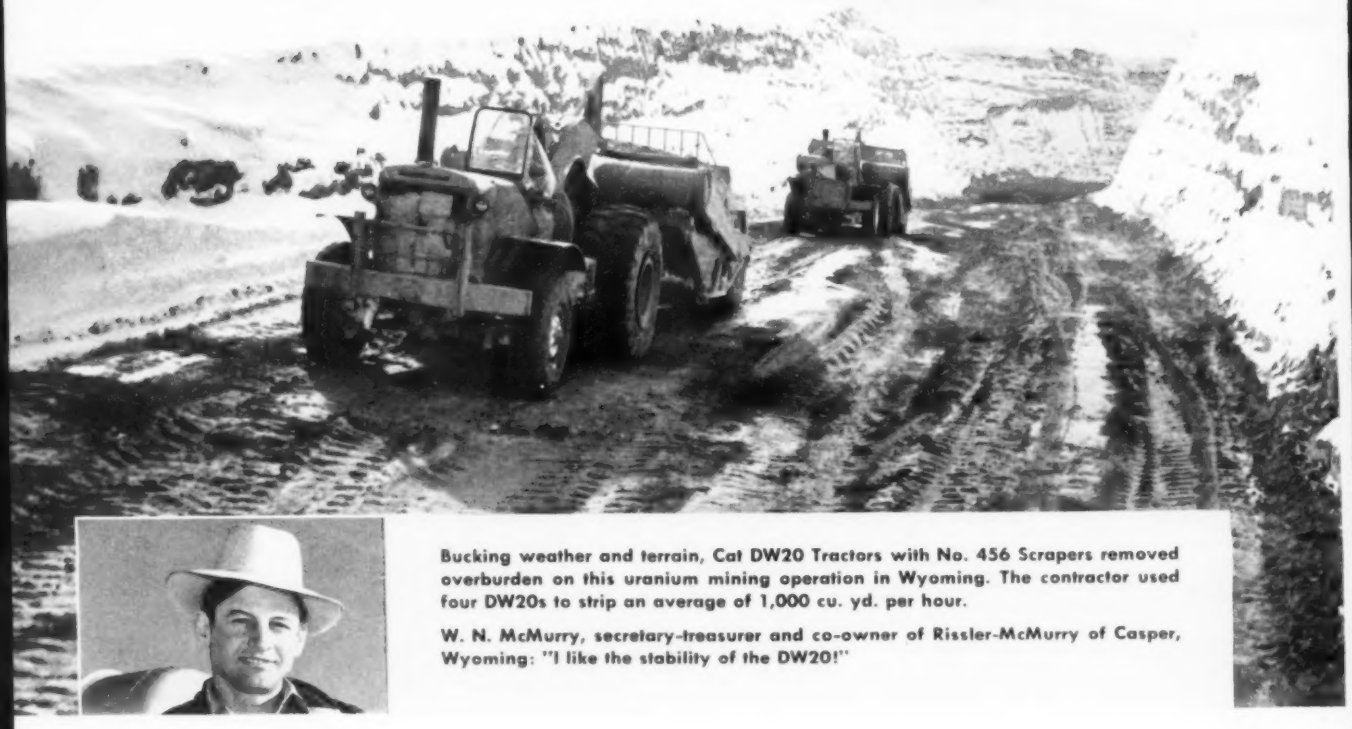

Bucking weather and terrain, Cat DW20 Tractors with No. 456 Scrapers removed overburden on this uranium mining operation in Wyoming. The contractor used four DW20s to strip an average of 1,000 cu. yd. per hour.

W. N. McMurry, secretary-treasurer and co-owner of Rissler-McMurry of Casper, Wyoming: "I like the stability of the DW20!"

Mining uranium near Riverton, Wyoming, Rissler-McMurry used four Cat DW20s with matching No. 456 Scrapers to strip overburden at the lowest possible cost per cu. yd. This contractor, working for Vitro Minerals Corp., has utilized Caterpillar machines for 16 years. The owners like the stability, economy and power of their fast wheel scraper-tractor combinations for loading and hauling. They also relied on the rugged punch of a Cat D9 Tractor, a maneuverable D8 and a No. 12 Motor Grader to get the job done on schedule.

The DW20s excavated a 350,000 yd. pit—moving an average of 1,000 cu. yd./hr. Average depth of the pit was 66 ft., and material consisted of loosely consolidated sandstone and gravel plus cemented claystone in the pit's bottom. The DW20s handled a 600-ft. 10% ramp at one end of the pit with ease.

Now the new DW20 (Series F) rig is faster than ever and packs even more punch. Powered with a brand-new Caterpillar Engine, HP is increased to 320 (maximum output). At equal rimpulls, speeds are 10% greater. And torque rise is more than doubled compared to previous models. So the big wheel units give faster cycling for high production and wider profit margins. Combined with a Caterpillar LOWBOWL Scraper, the DW20 is the top earth-moving team for pit mining and other tough jobs.

For an on-the-job demonstration, get in touch with your nearby Caterpillar Dealer today. Find out for yourself if wheel tractors and scrapers can do your stripping more profitably than trucks and shovels.

Caterpillar Tractor Co., San Francisco, Cal.; Peoria, Ill., U.S.A.

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Mining World

Including the Export Edition **WORLD MINING**

Published monthly except in April when publication is semi-monthly

VOLUME 20 **DECEMBER 1958** No. 13

OPERATIONS—TECHNOLOGY

Page

Open Pit Mining

ASARCO Drains Black Lake and Develops New Asbestos Mine .. 32

By pumping 55,000,000 gallons of water and dredging 27,000,000 cubic yards of lake bottom ASARCO has exposed ore for open pit mining at rate of 1,350,000 tons per year.

Asbestos Milling

ASARCO'S New Black Lake Mill Treats 10 Percent Asbestos Ore 32

By crushing, screening, and air separation ASARCO makes 14 grades of asbestos fiber. After third screening 35 percent of feed is rejected as tailing.

Dredging

ASARCO Strips Lake Bottom By Hydraulic Dredging 35

Suction dredge with 7-foot diameter cutting head pumps muck from lake bottom through 25,000 feet of 31-inch pipe to distribution points on shore. Best day's performance was 79,000 cubic yards.

Essen Fair

Record Number of Exhibits at Germany's Leading Fair 40

More than 500 exhibitors from 12 nations displayed their new equipment. The outdoor area was packed with full size operating machines.

Underground Crushing and Hoisting

Kiruna's New Hoisting Plant Raises 4,000 Tons Per Hour 42

Two-stage underground crushing reduces Kiruna's hard iron ore to minus-4-inches. Eight ASEA friction hoists are used. Skip loading is automatic.

Shaft Sinking

Shattuck Denn Sinks Bardon Shaft 16.3 Feet Per Day 37

Using only three men in shaft bottom to operate new telescopic shaft jumbo and safety skip the new Tom Bardon shaft goes down at fast rate to reach Utah uranium ore body.

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ON THE COVER

Alan Atkins, MINING WORLD's cover artist has done another special Christmas cover for you. His message "Peace On Earth" is seconded by the entire staff. We all wish you Merry Christmas and Happy New Year too.

MILLER FREEMAN PUBLICATIONS

GRAB SAMPLES From the Mail

Holman—Michell Flotation

Dear Sir,

In an article entitled "How Selective Crushing of French WO3 Ores is a Key to Gravity Concentration" which appeared in August 1958 MINING WORLD, reference was made to the Table Flotation process employed for removing sulphide minerals as being evolved at Panesqueira mine (Portugal).

In point of fact, it was evolved by myself in 1943-1944 and was first used commercially at the Cligga wolfram and tin mine in Cornwall, being described by me in the *Mining Magazine*, Vol. LXXIII No. 6 (Dec. 1945).

About the same time it was introduced at Geevor tin mine in Cornwall and later at Panesqueira mine and into a number of properties in Malaya.

A special table equipped with air-jetted pipes was designed and the process covered by British Patent No. 567,000, as well as sundry foreign patents.

Known as the Holman-Michell Flotation Table process, it is used extensively for removing sulphide minerals in tin and tungsten ores, as well as for the flotation of other minerals at a size too coarse for froth flotation, including molybdenite, fluorite, and mica.

F. B. MICHELL
Redruth,
Cornwall, England

Help Planning and Solving

Dear Sir:

Please change my address to that shown below. I am staying with the same company but have been transferred from the Haveri mine to the central office of Vouksenniska Oy. Your articles and advertisements have proved very useful to me in planning and solving current problems. I hope to continue reading WORLD MINING as regularly as before.

KALERVO RAISANEN
Munkkiniemen, Finland

More On Ore vs. Waste

Dear Sir:

Ore is ore, waste is waste;
Never the Twain can mix.
The rock in the box had better be pay,
A payroll will stand no tricks.

K. MALONE
Fallon, Nevada

Most Important and Informative

Dear Sir:

For some time I have not been receiving my copy of WORLD MINING, although some copies have reached me bearing my old address, P.O. Dalmorton, New South Wales, Australia.

My permanent address is given below.

I consider WORLD MINING the most important and informative journal printed on mining matters. There is no other publication issued that compares with it.

I plan to visit tin lodes in Northern Australia some 2,500 miles northwest of Melbourne, and if you would be interested in receiving news I will be happy to send it.

JOHN W. GRAIG
Consulting Engineer
Ivanhoe N21, Victoria

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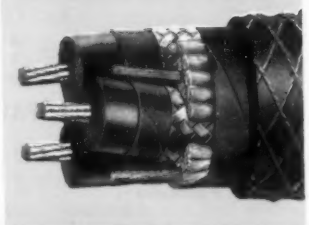

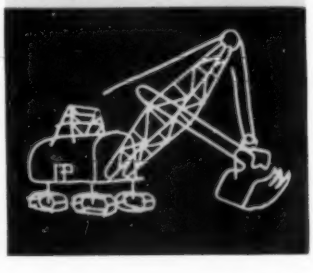

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MILLER FREEMAN PUBLICATIONS

Drifts and Crosscuts

Peace On Earth

No greater message, no greater hope can be expressed than by these three simple words. Peace On Earth is the wish of the MINING WORLD Christmas cover for 1958.

Artist Alan Atkins has done a magnificent job in presenting the Christmas feeling and spirit on the cover. Too, he has shown the spirit of the mining industry. Here's the reaction to the cover. "Why, that's Christmas at Butte," "I know that's Leadville," and "Christmas was like that in my home camp."

Wherever your home camp may be, the MINING WORLD staff wishes you the greatest Christmas blessing—Peace On Earth.

Bureau Speeds Up Reports

Soon after Marling J. Ankeny was sworn in as Director of the U. S. Bureau of Mines in July 1956, he granted MINING WORLD an exclusive interview which was printed in the September 1956 issue.

During the course of the interview, it was brought out that publication of the Bureau's *Minerals Yearbook* was lagging badly, that the most up-to-date issue was for the year 1952, and that the entire minerals industry looked to the Bureau for collection, interpretation, and publication of numerous statistical information. Of course this has long been one of the Bureau's basic functions.

It was a pleasant surprise to receive the three volumes of the 1956 Yearbook early in October and to learn personally from Director Ankeny that work on the 1957 volume was being rushed, while material for the current 1958 issue was already being assembled. It should be printed on schedule in 1959.

Statistics, particularly up-to-the-minute ones, do help the miner. They help him by making the sales of metal faster. Within the last month, two leading metal sales managers reported on the need for better statistics for base metals.

Congratulations to the Director and staff of the Bureau for efficiently overcoming the publication lag.

Prospector and Exploration

Almost daily, reports of the shift from prospecting and exploration to other employment are received from mining engineers, geologists, and field men.

Exploration activities are always the first to feel the sharp cut of the budget cutting knife—be it large or small company.

The growing demand and higher metal prices make the production phase of mining look better. It won't be long until exploration activity will pick up, too.

Unfortunately, it won't be easy to entice the geologist back from his missile work, or the fine long-experienced exploration manager from his contracting job, or the exploration drilling geologist from the road building crew.

Non-mining industry gains these skilled men, today. Tomorrow, it will be crying for metal these men should be finding and developing today.

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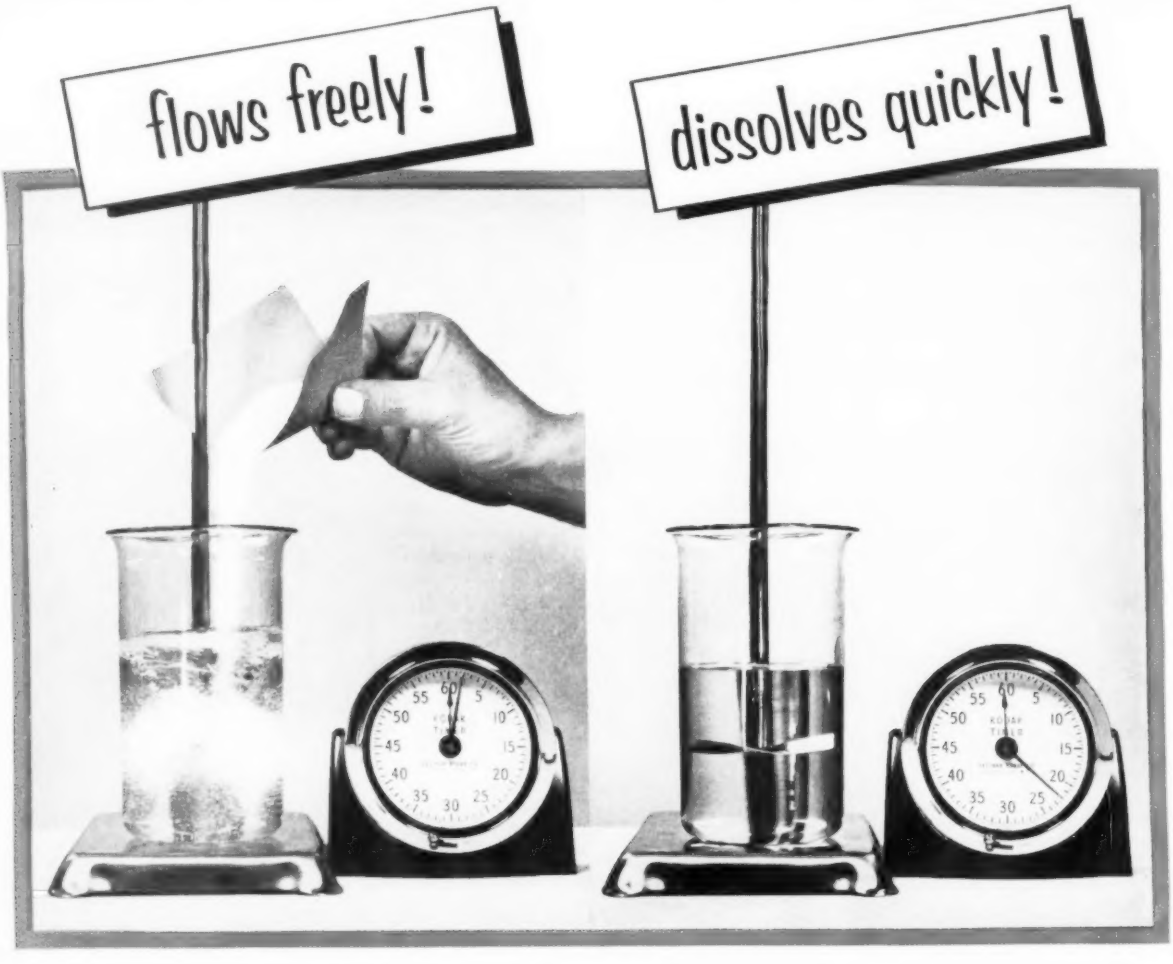

Here's graphic evidence of two more ways Westvaco Soda Ash helps cut your production costs!

Exceptional flowability speeds unloading and in-process handling. Rapid solubility saves processing time and labor.

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MINING WORLD NEWSLETTER

Moscow . . . Butte . . . Geneva

December 1958

What will be the result of the Soviet iron miners and steel producers recent visit to the United States?

U.S. equipment undoubtedly impressed them, and they would like to buy all kinds of production units—from jet piercers to tin plate rolling mills.

Soviet inquiries have already been revealed by the Foreign Commerce Bureau.

While this might be good business for manufacturers, those who sold equipment during World War II report that the Russians are interested primarily in one-of-a-kind orders.

Exports have to be licensed by Foreign Commerce section of Dept. of Commerce.

With Russia planning an ore and concentrate production of 160,000,000 tons by 1965, much of it will have to come from taconite-like ore requiring vast amounts of heavy mining and beneficiation equipment.

New projects underway:

Plans for another taconite plant on the Iron Ranges by 1964 or 1965 are reportedly being considered by a major producer. Predicted cost—$200,000,000.

An 8,000,000-ton stripping contract has been awarded by Anaconda for work at the Alice Pit in Butte. Though a regular silver producer, this seems like a large program for this mine.

A $10,000,000 sulphuric acid plant for manufacture of fertilizer will be built by Bunker Hill starting in 1959. There is much speculation on location. Our grapevine says Kennewick, Washington. Look for Bunker Hill to start mining phosphate, too.

A new uranium district appears to be developing some 30 miles southeast of Lander, Wyoming in Fremont County. The field is about the same distance southwest of the Gas Hills area which has been the center of interest since the 1955 boom.

Extensive improvements and modifications are planned for the Bonnie phosphate plant of International Minerals & Chemical in Bartow, Florida. The job is to be completed next summer.

News of other metals:

An investigation into fluorspar imports will be conducted by the Office of Civil and Defense Mobilization to determine whether they are threatening to impair the national security. The U.S. Tariff Commission has already denied an application for relief by the industry.

The titanium picture is brighter. Titanium mill product shipments are increasing for the third consecutive month, though metal output has not yet risen.

Consumption increases of more than 20 percent are predicted for copper, lead, and zinc in the next five years by a leading U.S. metal marketing expert.

Copper prices continue to move higher. Anaconda and Kennecott sold more than they produced in the past nine-month period.

A world-wide copper research program appears imminent. Foreign lead-zinc producers are already cooperating in a similar plan for their metals.

The United Nations lead-zinc meetings in Geneva are still underway at this writing, with stabilization of world market prices and production the major items for discussion.

"Talk up" increased production—greater safety...with these M-S-A COMMUNICATION SYSTEMS

M-S-A MINEPHONE

Dispatcher sends orders instantly and simultaneously to all motormen with this modern, underground two-way voice communication system. Motormen receive and reply while trips are in motion—keep haulage movements coordinated with production demands. This results in smoother, faster, and more continuous trip movements throughout the mine.

Messages clear tracks for outgoing loaded trips and incoming empties. This system puts an end to traffic tie-ups, errors and accidents; prevents excessive stop-and-start strain on equipment. Write for more detailed information.

• Dispatcher sends orders to motormen . . . routes right-of-way traffic . . . receives reports on positions and station conditions.

• "Jeep" operator requests instructions from dispatcher and maintenance shop for section assignment . . . speeds emergency repair.

M-S-A HOISTPHONE

For accurate, instant response between the hoisting engineer and cage, here's the voice communication system to install. Whatever the job—load leveling—shaft repairs—shaft inspection trips—passenger transportation—the M-S-A HoistPhone provides better safety and efficiency through dependable, continuous two-way voice communication at any level, and while the cage is in motion.

Requires no special training . . . simple to use . . . dependable in operation. Write for further information.

• The hoisting engineer is able to control all movements of the cage by communicating with cage rider over the M-S-A HoistPhone.

• Worker uses microphone in cage to tell the hoisting engineer where he wants to go. Loudspeaker mounted on top of cage.

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Capitol Concentrates

Will Customs Court Ruling on Bicycles Upset the Lead-Zinc Import Quotas?

How will the customs court ruling in the now famous escape-clause case pertaining to the importation of bicycles affect the quota program for lead and zinc? This question is being studied by producers, both domestic and foreign.

In the bicycle case, a three-man customs court ruled that the President could not vary the Tariff Commission's findings, but had to accept or reject "in toto." Washington experts comment that the ruling will have no effect on the imposition of lead-zinc quotas, unless separate suits based upon the bicycle decision are filed. However, they add, the chances are not too remote that foreign producers might bring such a suit.

With respect to the Customs Court ruling on the bicycle case, the final results of the decision will not be known for a long while. The case will now be appealed in the Court of Customs and Patent Appeals and subsequently, if the government loses, to the United States Supreme Court. Thus a final decision in the matter will be at least two or three years in the future.

The opinions expressed by various attorneys are divided, some feeling that the Customs Court is right, others that it erred. However, it must be remembered that the government has a great deal at stake in the matter. Of the nine escape-clause cases on which the President has taken action (including the lead-zinc case), only one met the test laid down by the Customs Court. It has always been presumed by most people that the President was granted, under Section 350 of the Trade Agreements Act as amended, broad and sweeping powers to reject, accept or modify in any manner he saw fit, a Tariff Commission decision in an escape-clause case.

Another point which should be kept in mind is the fact that, if this decision should prevail, Congress unquestionably would amend the Trade Agreements Act to grant the President the powers which the Customs Court says he does not have now. Since the extension of the act swept through Congress during the last session with such an overwhelming majority and because, generally speaking, the 'free traders' want the final authority on a broad basis to rest with the President, further legislation would be indicated.

• Money Can't Be Used as Intended

The last Congress appropriated $3,000,000 for upgrading materials either in the national stockpiles or in the GSA inventories. It was understood that the members of the Senate and House Appropriations Committees intended the money to be used to up-grade sub-standard chrome and manganese. Unfortunately, the money was not tagged so that it could be used for items no longer on the strategic purchase list or, in other words, for non-defense purposes. The result is that the money went to OCDM as an open appropriation under the Defense Production Act, usable only for items necessary for the national defense under the act and the stockpile formula. This ruled out chrome and manganese, which are surplus in the stockpiles. The money probably will be used to up-grade oxygen-free copper, ferromolybdenum, ferrovanadium, molybdic oxide, and tungsten-carbide—something far from the sponsor's thoughts.

• Military Plans Influence Metal Markets

The metals business inevitably is influenced by military decisions. The swing from planes to missiles retarded the titanium business so that it may take years to bring that metal to the point it would have achieved had the forced-draft military program continued. Consequently, metal and mineral producers should watch pronouncements from the Pentagon closely, such as the one by Defense Secretary McElroy, who said, "In the development of our long-range ballistic-missile programs your defense board of directors believes we are at the point where the spending for more tax dollars at this time would be an unwarranted risk of our money."

Such shifts in policy, of which the above is merely an example, cause changes in emphasis on the use of various materials.

• Quotas Do Not Apply to Barter Deals

One question which is being asked frequently is, "Does lead-zinc obtained under the barter program count against the new quotas?"

The answer is "No."

Any material acquired by a government agency is in addition to the quotas set by the President. Bartered material, of course, does not overhang the market. It is locked up for use in emergencies, which must be declared by the President, in the same way that the national stockpiled materials are locked up.

Considering the enormous agricultural surpluses which will be available this year and which will create additional pressures to barter, this provision is an important matter to the mining industry.

• Silver Act Repeal Will Be Attempted

The Silver Purchase Act, in all probability, will be in for another assault next year. Senator John F. Kennedy of Massachusetts made a strong campaign promise that he would attempt to repeal the act if re-elected to the Congress. Kennedy is laboring under the delusion that repeal will cheapen the price of silverware and jewelry made in his state. While repeal might possibly add to the manufacturer's profits, there is small likelihood that it would reduce retail prices.

• Mittendorf's Resignation Is Regretted

The extension of the DMEA as the Office of Minerals Exploration is being applauded by the mining industry. However, the resignation of C. O. Mittendorf as administrator (directly under the new setup) is regretted greatly. Mr. Mittendorf, working against difficult administrative problems, built up DMEA into one of the smoothest running agencies of the government. The domestic mining industry wishes him the best of luck in his new position as director of industry and transportation in Iran for the International Cooperation Administration. So far, no successor has been named by Interior Secretary Seaton.

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GYRATORY and CONE CRUSHERS for low cost–big capacity Primary and Fine Reduction Crushing

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The most important reason behind this preference for Symons is the fact that these soundly engineered, heavy duty crushers produce more material to desired specifications, use less power, give maximum life of crushing members and, in most cases, require less operating personnel.

Nordberg welcomes your inquiry and the opportunity to work with you in helping to solve your specific crushing problems. A copy of Bulletin 247 will gladly be sent upon request.

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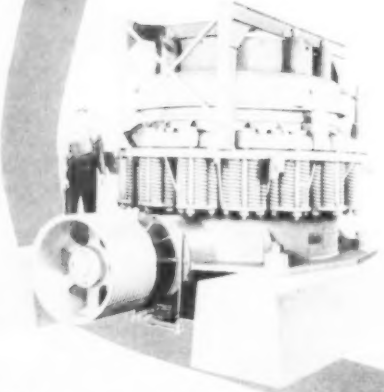

For heavy duty primary breaking, Symons Gyratory Crushers are available in 30", 42", 48", 54", 60" and 72" sizes, for capacities up to 3500 and more tons per hour. For primary, secondary and finer reductions, Symons Cone Crushers, in Standard and Short Head types, are available in sizes ranging from 22" to 7'—in capacities from 6 to 900 or more tons per hour.

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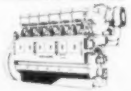
NORDBERG GRINDING MILLS

NORDBERG MINE HOISTS

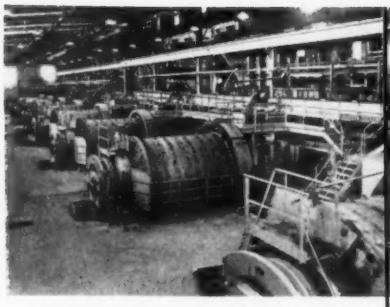
SYMONS VIBRATING GRIZZLIES and SCREENS

NORDBERG ENGINES

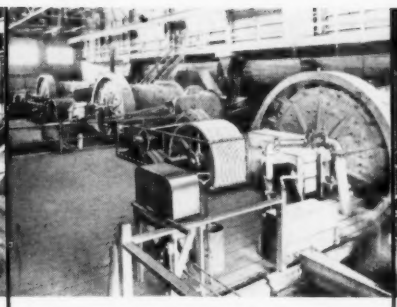


©1958 Nordberg Mfg. Co.

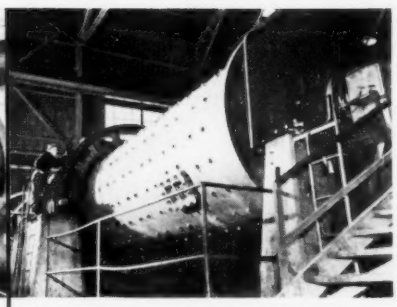
C457-R



This large copper company has 17, 9½'x 12' and three 10'x 14' Marcy Open End Rod Mills; three 8'x 12' and three 10'x 12' Marcy Grate Discharge Ball Mills.



Three of five 8'x 9' Marcy Grate Discharge Ball Mills in a large copper mill.

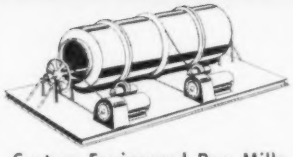


This 8'x 20' Marcy Pebble Mill is one of 21 Marcy Mills used by a molybdenum company.

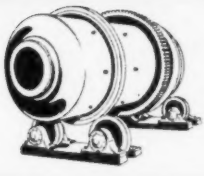
Marcy Grinding Mills

- grate discharge ball mills, open end rod mills, tube mills, pebble mills, center and end peripheral discharge rod mills, acid-proof mills, batch mills.
- for metallic and non-metallic ores, cement, specification sands, clay, fibrous material.
- wet or dry grinding.
- 29 different diameter sizes, from 12" to 12'6" inside diameter, are operating and proved in the field.
- grind material 1½" or finer to a product as fine as 325 mesh.
- capacities up to 6650 tons per 24 hours.

Other Products

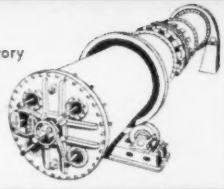


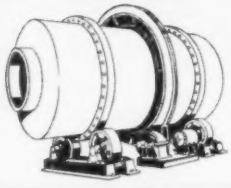
Custom Engineered Pug Mills.



Custom Engineered Leaching Drums.

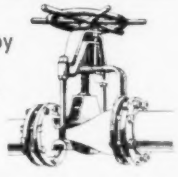
Burt Filters.
30"x 72" Laboratory Unit, and 5'x 40' Standard Commercial Size.

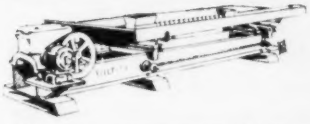




Custom Engineered Fusion Furnace.

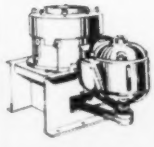
Massco-Grigsby Pinch Valves. 1" to 14" dia.



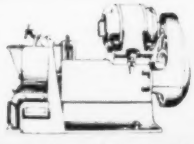


Wilfley Concentrating Tables.
Laboratory and Commercial Sizes.

4"x 6" Massco Laboratory Jaw Crusher.



6" and 10" Massco Gy-Roll Reduction Crusher.



Massco-McCool Pulverizer.

Marcy Direct Reading Pulp Density Scale.

Manufacturing Division

THE MINE AND SMELTER SUPPLY CO.

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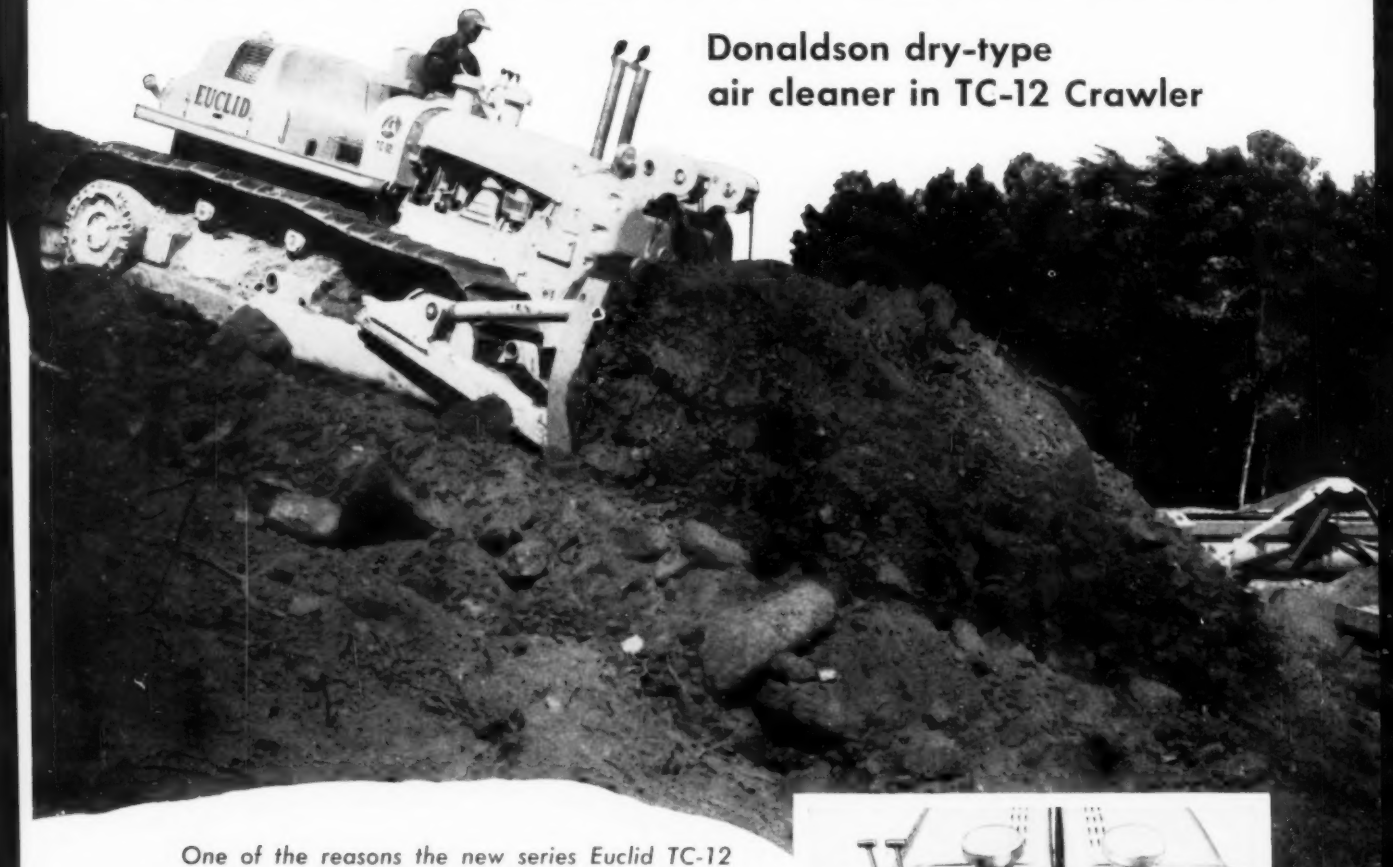
SALES AGENTS in Peru, Chile, Philippine Islands, Japan, New York City (for Continental Europe) and in principal cities of the U.S.

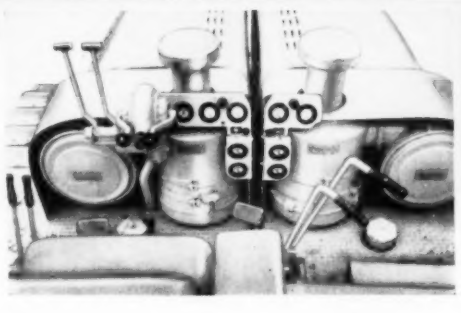
Another EUCLID product improvement!



Donaldson dry-type air cleaner in TC-12 Crawler

One of the reasons the new series Euclid TC-12 Crawler provides more work-ability with less down-time is the unequalled accessibility of all major components for quick, easy servicing.

As shown in the photograph, the two Donaldson dry-type air cleaners, one for each engine, are conveniently located for easy access. Both pre-cleaner and secondary filter can be serviced in a fraction of the time required for oil bath cleaners and there's no mess—just empty the pre-cleaner dust cup, clean and replace a paper element in the secondary cleaner.



HIGH EFFICIENCY CLEANER INCREASES ENGINE LIFE

The Euclid TC-12 Crawler is now being built with the Donaclone dry-type air cleaner as standard equipment. This 99.9% efficient cleaner reduces engine wear caused by dust—increases the service life of the engine and helps maintain top operating efficiency. Engine manufacturers say that 8 ounces of abrasive dust can ruin an engine in a short time. Because of the tremendous volume of air that passes through an engine in a single shift, the importance of air cleaner efficiency is obvious. That's why Euclid uses this Donaldson cleaner on the new series TC-12 . . . it's another example of constant product improvement that makes Euclid your best investment.

EUCLID Division of General Motors, Cleveland 17, Ohio

GM GENERAL MOTORS EUCLID

EUCLID EQUIPMENT

FOR MOVING EARTH, ROCK, COAL AND ORE

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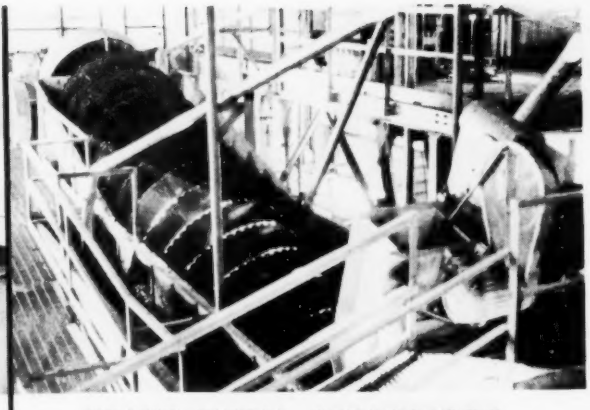
AKINS CLASSIFIERS

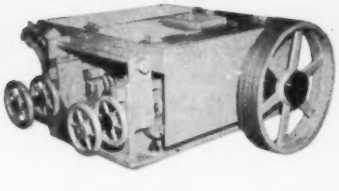


HEAVY MEDIA SEPARATORS

Cost Cutting Equipment

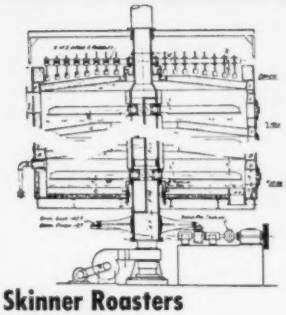
The Akins Classifier was originally developed, in 1908, for use in closed circuit with a ball mill. Its outstanding success led to many other applications where it has demonstrated its superiority... dewatering and recovering fine solids; sand and slime separations; washing coal, sand, and oyster shell; desliming and de-oiling phosphate rock and concentrate; sink-float concentration; and many others. The Akins is made in sizes up to 84", simplex and duplex, in two types—small and large settling pool. The Akins Heavy-Media Separator is the only unit available which can make a 3-product separation in one machine from one medium cleanup circuit.

Other Products



Laboratory Crushing Rolls

Sizes (Dia. x width): 8" x 4", 10" x 6", 10" x 8", 12" x 10" and 12" x 12". Adjustable roll space setting up to ¾". Double V-belt drive. Heavy, cast Meehanite frame absorbs vibration, results in long life. Heavy duty alloy spring take-up. Unit is completely enclosed to eliminate dust and safety problems.



Skinner Roasters and Dryers

For roasting, calcining, and drying ores, clays, limestone, limestone mud, flotation concentrates; decomposing oil sludge in the process of recovering sulphuric acid. Coal, oil or gas fired. Sizes to 23'6" inside diameter; up to 12 hearths.

Vezin Sampler

A continuous sampler for crushed feed. 10, 5 or 2½% cut. 5 sizes, 20" to 60" dia., with capacities to approximately 500 tons per hour. Will handle material up to 2½". Anti-friction upper bearing and replaceable bronze-bushed lower bearing. Easily replaceable rubber or abrasion resistant steel liners for cutter and reject chute. Alloy white iron cutting lip. Easy addition of mixing barrel, operated from same drive.

Manufacturing Division

THE MINE AND SMELTER SUPPLY CO.

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LICENSED MANUFACTURERS AND SALES AGENTS in Canada, Australia, Sweden, England, South Africa

SALES AGENTS in Peru, Chile, Philippine Islands, Japan, New York City (for Continental Europe) and in principal cities of the U. S.

TOURNAPULL REAR-DUMPS: Available in 3 heavy-duty sizes for dependable off-road hauling. B Rear-Dump carries 35 tons (31.7 met. tons), choice of 300 hp diesel engine with sliding-gear transmission, or 335 hp engine with torque converter. Top forward speed is 30 mph (48.2 kph). C Rear-Dump has 22-ton (20-met.-ton) capacity; 210 hp diesel engine with sliding-gear or constant-mesh transmission. Travel speeds are as high as 32.1 mph (51.6 kph). D Rear Dump carries 11 tons (10 met. tons). Its engine is rated at 138 hp. Manual transmission is standard. Machine travels at forward speeds to 29.5 mph (47.4 kph).

TOURNAPULL SCRAPERS: Scrapers for Tournapull prime-movers are available in 3 sizes: B Fullpak, 27 yd^3 (20.6 m^3) capacity; C Fullpak, 18 yd^3 (13.7 m^3); and D Tournapull, 9 yd^3 (6.8 m^3). These scrapers are interchangeable with Rear-Dump, Bottom-Dump, Flatbed, or lift-and-carry Crane.

These mining machines will help reduce your operating costs

For the exacting requirements of mining, you need strongly built, dependable machinery. And for minimum costs, you need fast-working machinery as well. Strength, dependability, speed and effective use of power are built into every unit of the LeTourneau-Westinghouse line: Tournapull scrapers, Rear-Dumps, Tournatractors, and Adams model graders.

Check the economical production ability you get with these modern machines. Study the specifications. Ask for complete facts on the type of units which can be used profitably in your operations.

C TOURNATRACTOR: This 210 hp, rubber-tired tractor travels anywhere under its own power, at speeds to 17.2 mph (27.6 kph) forward, and to 7.2 mph (11.5 kph) in reverse. Attachments include: dozer blade, Angledozer, root rake, push-block, power-control-unit, winch, side boom, tree stinger, rail coupler, and snow plow. Tournatractor tows sheepsfoot rollers, scrapers, rooters and other equipment.

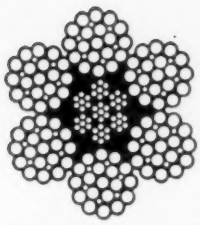
ADAMS MODEL MOTOR GRADERS: These are available in seven models, with hp from 60 to 190. Standard models of heavy-duty type have eight forward speeds to 26 mph (41.8 kph), four reverse speeds to 13 mph (20.9 kph). A gear assembly for three extra low speeds is optional. The POWER-Flow 660 has 190 hp engine with torque converter. It has forward speeds to 27.4 mph (44 kph). The LeTourneau-Westinghouse POWER-Flow 550 has 135 hp with torque converter. The handy 60 hp "220" has forward speeds to 18.3, reverse to 3.2 mph. Attachments for grader line include: snow plow, wing, "Snow-Blo" attachment for wing, scarifier, power-shift moldboard, bulldozer, rotary snow plow, and Jebco Elegrader (for sidecasting materials). The LeTourneau-Westinghouse Adams Model TraveLoader picks up windrowed material for casting into trucks.

POWER-Flow, Tournapull, Tournatractor, Angledozer, Fullpak—Trademark Reg. U.S. Pat. Off.; Adams—Trademark LA-1796-M-1m

LETOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit



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...save money...increase safety

In many operations where wire ropes occasionally operate near their breaking strength, it will pay you to switch to Double Gray. If you use Double Gray on your present equipment, under equal load conditions, you'll get a safer, more economical operation. That's because Double Gray's higher strength* allows you to operate with a greater safety factor—resulting in longer rope life and less equipment downtime.

***** *Wickwire Double Gray Wire Rope is made of extra-improved plow steel. Fortified by an independent wire rope core of the same extra high strength steel, Double Gray rope has a 15% higher breaking strength than the catalog breaking strength of an improved plow steel rope with IWRC.*

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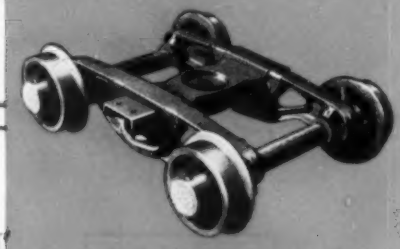
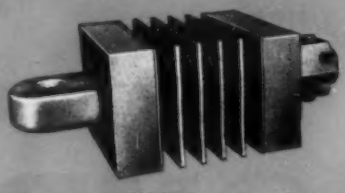
LOOK FOR THE YELLOW TRIANGLE



NC-T MINE
CAR TRUCKS



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CUSHIONING UNITS

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NATIONAL DEVICES

No matter whether you're considering the purchase of new mine cars or locomotives . . . or whether you're thinking of upgrading existing equipment *now* is the time to investigate the advantages of National devices.

For every day cost-conscious operators everywhere are switching over to National devices because they know they get more out of their equipment investment per workshift . . . per day . . . per year.

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NACO
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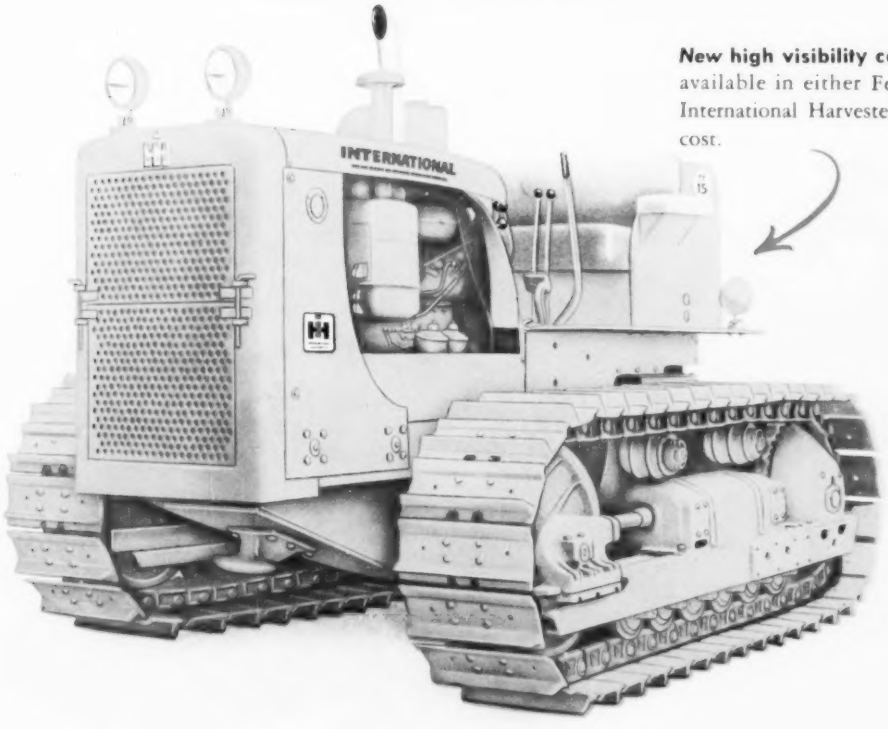
WILLISON
AUTOMATIC COUPLERS

NEW International® TD-15 tops 100-hp field...

with exclusive power and control features!



New high visibility color. Optionally available in either Federal yellow or International Harvester red at no extra cost.

NEW

6-cylinder diesel power . . . 105-hp fully-proven D-554 engine—full 20,500 lbs drawbar pull.

NEW

6-speed full-reverse transmission . . . 20% higher reverse speeds. A speed for every work or travel need plus fast "Shuttle-Bar" direction changing!

NEW

Precision control

Foot Decelerator for instant speed changes —fast "Shuttle-Bar" forward-reverse travel.

NEW

1,000-hour lube interval, heavy-duty track rollers

. . . heavy-duty, long-life bushing type, with extra capacity lube reservoir.

...and here's the pay-off for you...

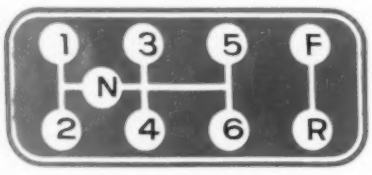
You move in on...and speed up

....with NEW TD-15

For "easing up" on power and speed without letting go of steering levers or other controls, simply use the optional "no hands" Foot Decelerator!

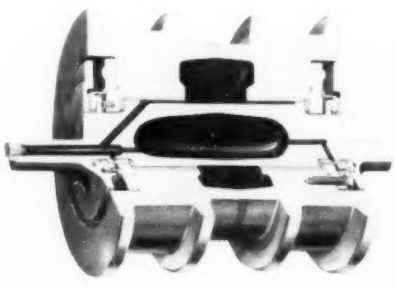
Exclusive six-speed "single stick" shift... forward and reverse "Shuttle-Bar"

You shift through all six speed ranges of the new TD-15—forward or reverse—with a single lever. Shift pattern is planned for gear-changing ease and speed with a fast sweep of the hand—to give you instant use of the speed you need. To speed the work-cycle and take full advantage of fast shifting, you simply push or pull the "Shuttle-Bar"—to change TD-15 forward or reverse instantly.



1,000-hour lube interval, heavy-duty, track rollers

Not just another "claim" . . . International now combines heavy-duty *bushing design*, exclusive cartridge-type *metal-to-metal seals*, and king-size lube reservoirs, to offer the industry the first heavy-duty type roller as standard equipment on the TD-15. Thick shells for safe build-up and exclusive pressure relief passages for flush-out and prevention of seal damage from power lubricators are part of this new design.



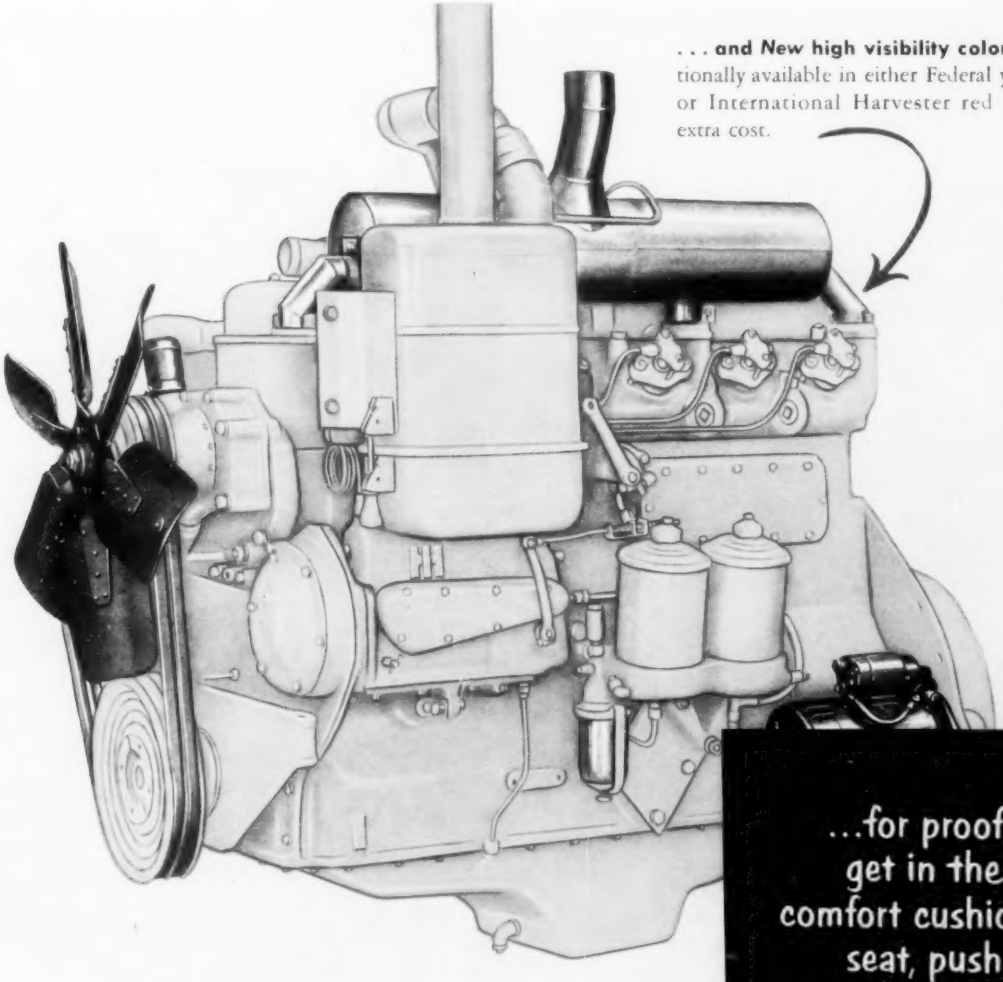
...a whole new range of jobs...

capacity and control

Smooth 6-cylinder... BIG 105 IH diesel horsepower

You get 6-cylinder smoothness from this new International D-554 diesel engine that powers the new TD-15. This fully-proven power plant produces its 105 net hp at 1,650 rpm ... features famous International 45-degree angle operation full-flow lubrication, closed pressurized cooling, exclusive twin plunger pump fuel injection system, fully counter-balanced crankshaft, positive valve rotators, and all-weather gasoline conversion starting. Here's an engine built for long life, big-capacity output!

New power, strength, control, and reliability features like these show you how and why the 105-hp TD-15 tops its field. You move in on a new range of heavy jobs—material-moving, land-clearing, hauling, loading, excavating, logging, mining—that no longer belongs to next-size-bigger crawlers!



... and New high visibility color. Optionally available in either Federal yellow or International Harvester red at no extra cost.

...for proof, get in the comfort cushioned seat, push the "button"...

Compare TD-15 performance to anything *in the 100 hp crawler field!*

Prove to yourself you can move in on, and speed up, a whole new range of heavy jobs—with new TD-15 capacity and control. Put the TD-15 through its paces—compare *power*, *speed*, *capacity*, and *control* to anything else on tracks in the 100 hp field. The 6-speed full-reverse transmission and "Shuttle-Bar" will show you on-the-job how fast, easy, and profitable shuttle-cycle operations can be! Press the decelerator and see what a helper this feature can be for actually speeding up operations—by reducing declutching and shifting time! Measure sintered metal, dry-type clutch full power transfer efficiency and maintenance, ease and economy to any other crawler's clutch—wet or dry! See your International Construction Equipment Distributor for a new TD-15 demonstration!

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A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors . . . Self-Propelled Scrapers and Bottom Dump Wagons . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Haulers . . . Diesel and Carbureted Engines . . . Motor Trucks . . . Farm Tractors and Equipment.

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for quality and service... **specify GENERAL CABLE**

RIPPING DIGGING

This CAT No. 977 Traxcavator increased production 30%

Dixie Mines, Inc., one of the nation's largest producers of hi-grade mica, was using a competitive machine until last year in one of their mines. This mine, near Heflin, Alabama, is under the direct operating supervision of the firm of Bailey and Van Horn. Then a Caterpillar No. 977 Traxcavator with No. 6 Ripper was put to work. Result:

"By using the No. 977 we have upped our production 30%," says Joe W. Bailey, resident manager. "It loads faster, lifts faster and is mobile. Besides working the overburden and the mica bearing pegmatite, we use it to feed the mill at night, build dams, maintain roads and many other jobs. It's a good all-around machine—and we're happy with the freedom from down time and low cost of operation."

The No. 977 rips the tough pegmatite then loads it into trucks. During a ten-hour day, production averages 500 cu. yd. The material is put through a jaw crusher, washed and screened, leaving a concentrate of mica as residue.

The No. 977 works at such a money-making pace because it's built from the ground up as a loader-excavator, not just a tractor with bucket attached. About 26 sq. ft. of ground-gripping track provide tremendous traction to crowd the 2¼-yd. bucket full every time, get away fast.

In addition, operator comfort means that this fast pace is maintained. He has a high seat with excellent visibility of all bucket positions. Controls are easily reached—bucket control a one-hand operation.

Your Caterpillar Dealer has three sizes of Traxcavators in his line. Get the full story on them today. Have him demonstrate on your job. Count on him for fast service and quality Caterpillar parts.

Caterpillar Tractor Co., San Francisco, Cal.; Peoria, Ill., U.S.A.

CATERPILLAR

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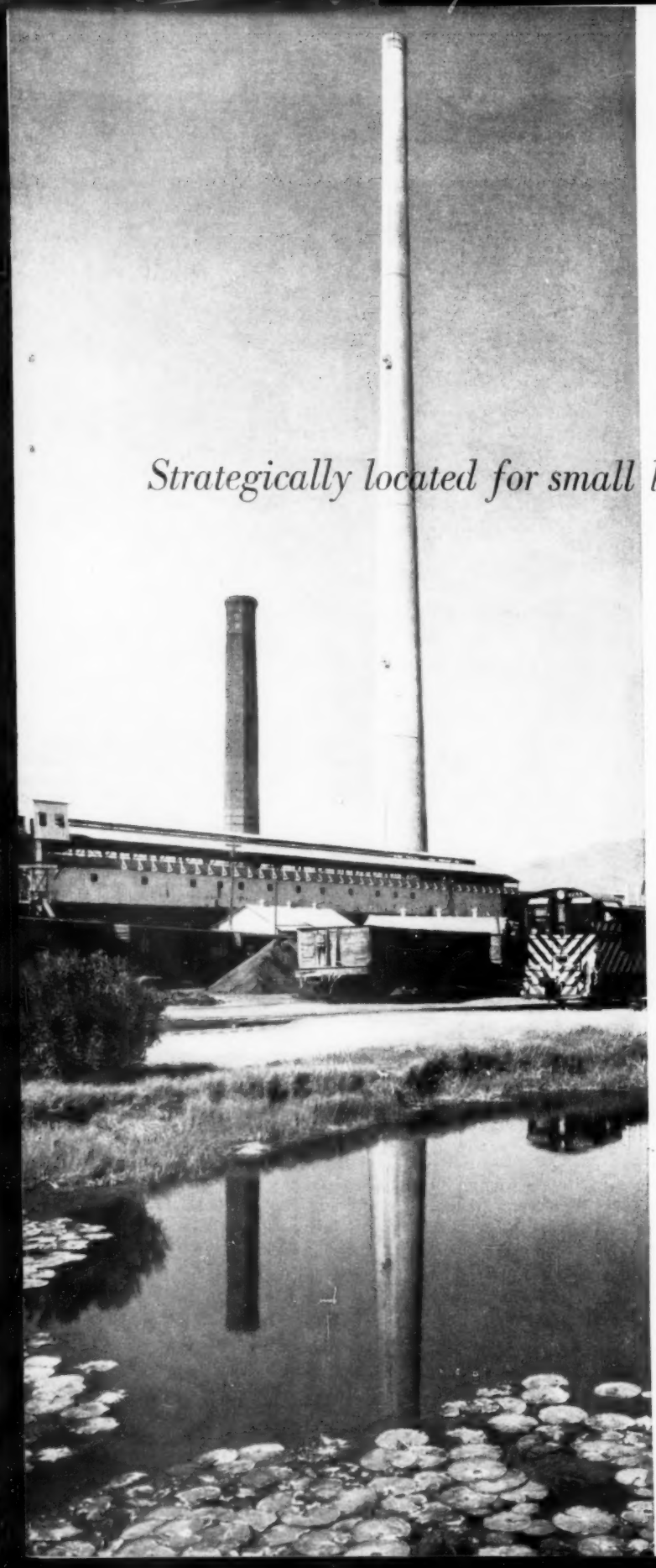
THE NO. 977—POWER AND VERSATILITY FOR MINING



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buying, smelting, and
refining all types of ores:
GOLD, SILVER, LEAD,
COPPER AND ZINC ores
and concentrates, blister
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22 Smelters and Refineries

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ZINC SMELTERS
Amarillo, Texas
Corpus Christi, Texas
Rosita, Coah., Mexico

COPPER SMELTERS
Hayden, Arizona
El Paso, Texas
Tacoma, Washington
San Luis Potosi, S.L.P., Mexico

LEAD REFINERIES
Selby, California
Omaha, Nebraska
Perth Amboy, New Jersey
Monterey, N.L., Mexico

COPPER REFINERIES
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Tacoma, Washington

See management
at above locations
or write to main office.
American Smelting and
Refining Company,
Ore Purchasing Department,
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58-54

ASARCO

MEMO TO MEN ON THE RISE:

WHERE THERE'S BUSINESS ACTION THERE'S A BUSINESSPAPER

One of the stepping stones to success is the ability to get the *inside word* on what's going on in your business. There's no better source for that *word* than the businesspaper serving your particular field.

In fact, there's no other source so complete, so timely, so authoritative. For facts. For news of the trade or industry. For fresh ideas in design, engineering, production, marketing. For the special information a man in any business needs to make decisions.

The man on the rise, like the man on top, reads his businesspaper . . . searchingly, carefully, thoroughly. Searchingly, for information he must have. Carefully, because he's reading for profit, not for pleasure. Thoroughly, because he wants to know, *what's in it for me?* And, for these reasons, he reads the advertising with the same intense concentration he devotes to the editorial pages.

To keep on rising in your field take out your own subscription to your businesspaper. Then read every issue. Searchingly. Carefully. Thoroughly.

MINING WORLD

mf A MILLER FREEMAN PUBLICATION

ABC ABP

One of a series of advertisements prepared by THE ASSOCIATED BUSINESS PUBLICATIONS

For drifters, sinkers and stopers . . .

NEW TIMKEN® THREADED BIT CLEARS CHIPS FASTER TO DRILL MORE HOLE-PER-BIT

When you use this new Timken® bit you drill rock—not chips—because chips clear faster. Its newly positioned 5 front holes jet-propel air or water against the rock face. And deeper, wider wing clearance and deeper relief under the heel help clear the chips extra fast. This quick wash-back ends the problem of clogged drill steels, protects your bit skirts against damage, lets you drill more feet-per-bit.

You get even more hole-per-bit because new special analysis carbides give this new Timken threaded bit greater resistance to shock and wear. And you can recondition it many times. Its redesigned heavier wing speeds drilling. Improved thread contact cuts breakage to a minimum.

For drifters, sinkers and stopers, this new Timken threaded carbide bit is the one to give you more hole-per-bit. For a free brochure that gives all the details write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

FOR OTHER TOUGH DRILLING JOBS

Improved Timken all steel multi-use bit gives you lowest cost per foot-of-hole—with correct, controlled reconditioning—when you can drill full increments of steel.

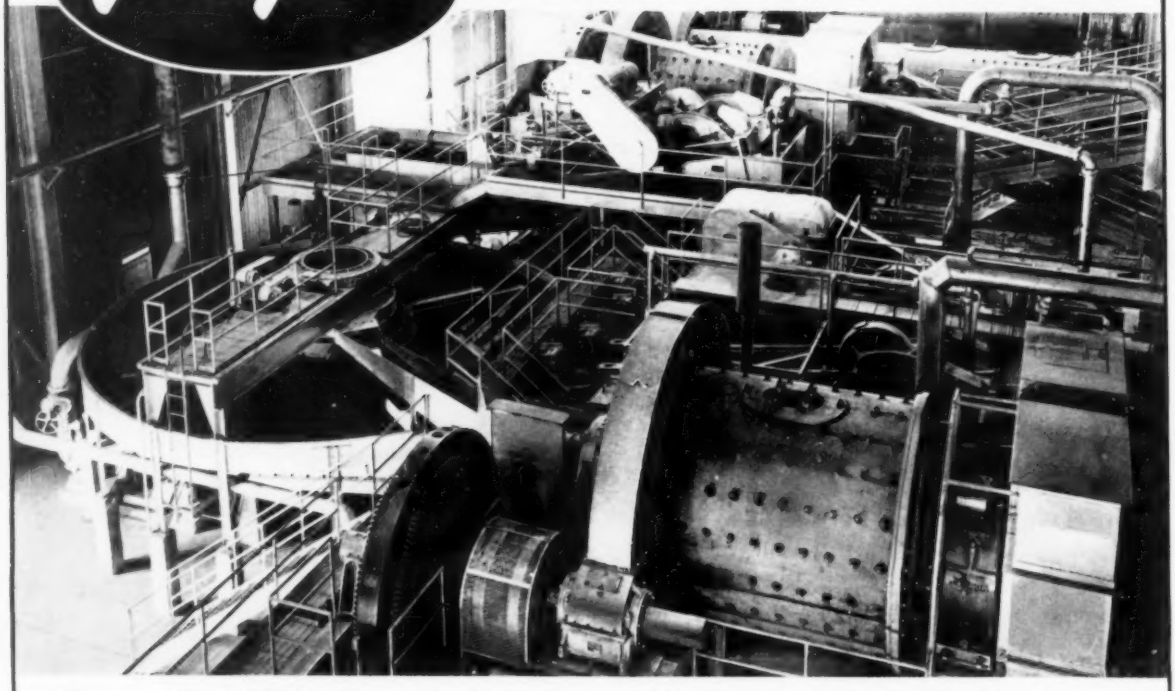
New Timken tapered socket bit is removable for full steel life, tapered for more secure union, and has same new frontal features as threaded bit. It's the air-leg bit of the future—here today!

TIMKEN REMOVABLE ROCK BITS

TRADE-MARK REG. U. S. PAT. OFF.

DEPENDABLE

Traylor-MADE BALL MILLS



Traylor Ball Mills are made in two general types—overflow and diaphragm discharge. They are designed and built to be used for either wet or dry grinding. Shells are of all welded steel construction. The trunnions are cast integrally with the detachable heads. Main bearings are made of Meehanite* metal, each fitted with a high pressure Alemite pump.

Driving gears are steel, precision cut on our Maag gear generator. Mills may be fitted with drum feeders, scoop feeders or a combination of the two.

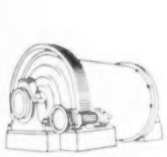
Traylor-made Grinding Mills can be made in any size to meet any requirements. Write for bulletin No. 11-121 for information on Ball, Rod, Compartment and Tube Mills.

TRAYLOR ENGINEERING & MFG. CO.

2022 MILL ST., ALLENTOWN, PA.

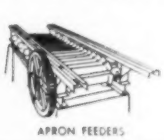
Sales Offices: New York — Chicago — San Francisco

Canadian Mfr.: Canadian Vickers, Ltd., Montreal, P.Q.



BALL MILLS

ROTARY KILNS



APRON FEEDERS

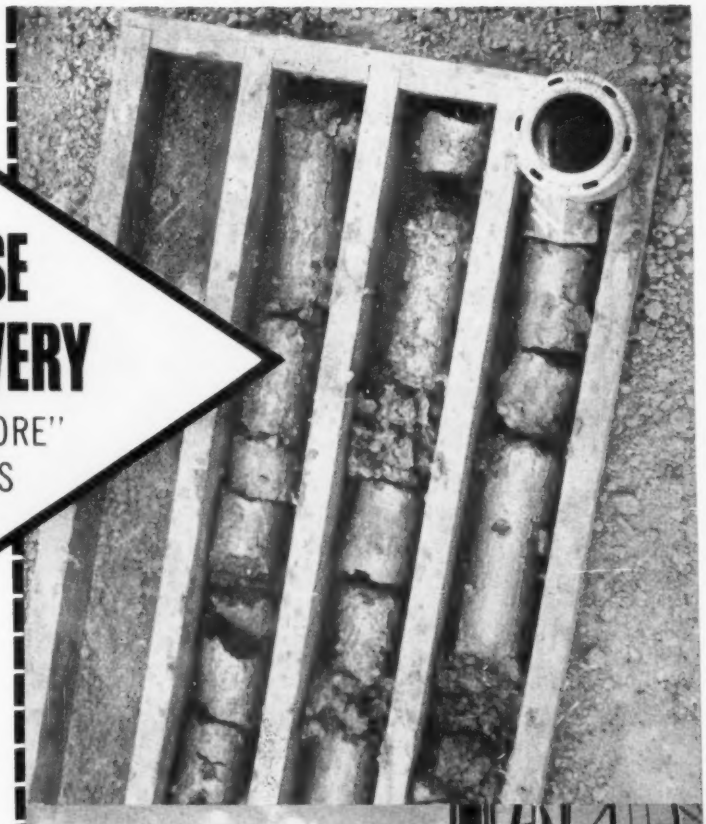
PRIMARY GYRATORY CRUSHERS

JAW CRUSHERS

SECONDARY GYRATORY CRUSHERS

INCREASE CORE RECOVERY

IN "HARD TO CORE" FORMATIONS



Christensen adapts equipment to deliver highest percentage core recovery

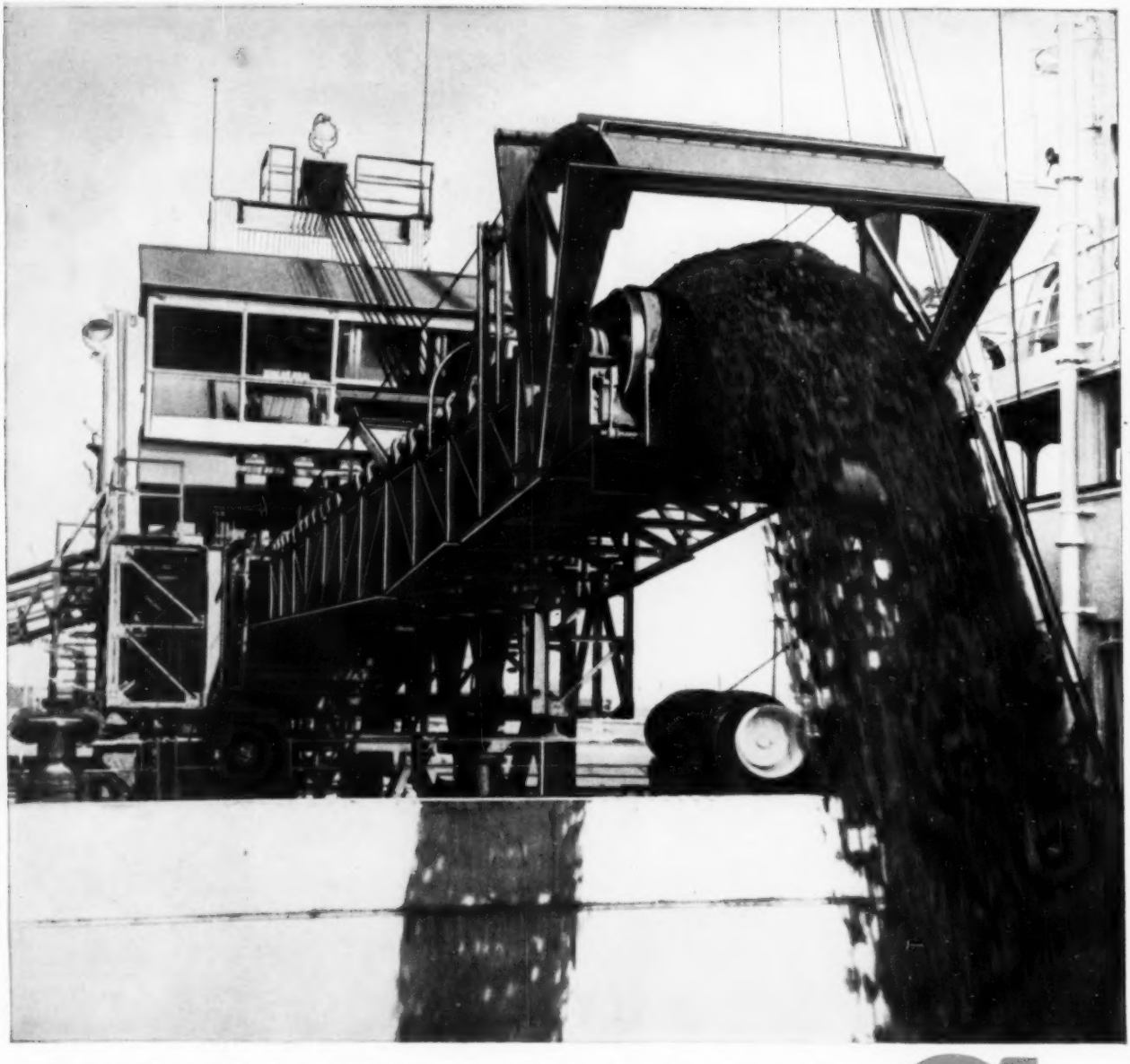
Until recently the mining industry has had to put up with very poor core recovery in soft, sticky or unconsolidated formations, making accurate analysis of ore reserves extremely difficult. To increase core recovery Christensen, working closely with the operator, adapted equipment to the job. This newly adapted soft formation equipment cores ahead of the circulating fluid, protecting the core from fluid erosion. Today the geologist is receiving complete soft formation cores which enable him to fully analyze the ground below the rig for productive ore bodies. This is the result of a Christensen field consultant working in the field with the operator to adapt equipment to the job. **Whether it is soft formation or hard abrasive fractured rock, Christensen know-how is always available to help you increase core recovery and operate at "less cost per foot," regardless of operating conditions.** Call or write the Christensen field consultant nearest you today.

Every dollar invested in exploration is spent for the sole purpose of evaluating ore reserves. To properly analyze the ground below the rig, the geologist must have "good" cores. Christensen's 4½" x 3", B-3018 barrel delivers best possible cores in soft formations. For more detailed information write Christensen Diamond Products. Specify No. SF-967.

Diamonds Mean, "Less cost per foot."

CHRISTENSEN DIAMOND PRODUCTS

1937 SOUTH SECOND WEST • SALT LAKE CITY, UTAH



Part of a huge ore handling system at Seven Islands, Quebec, this is one of two 60" wide boom type belt conveyors which feed ore directly into a ship's hold. The twin boom ship loading system delivers 8000 T.P.H.

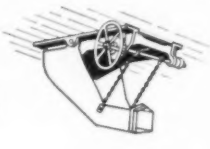
STEPHENS-

THE BIG NAME IN BULK MATERIALS HANDLING

BELT CONVEYORS

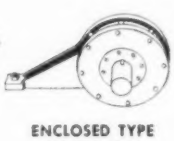
CARRIERS

MANGANESE STEEL PAN FEEDERS



TUNNEL GATE

SWIVELOADERS



ENCLOSED TYPE HOLDBACKS

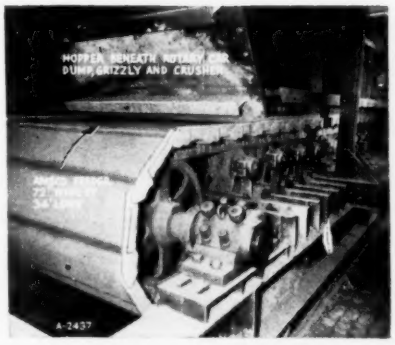
FROM MINE TO MILL--THE S-A WAY

Swift, economical handling of vast ore tonnages made possible with conveying equipment conceived and engineered by Stephens-Adamson

The fantastic ore tonnages being carried today from mine to mill, have been made possible largely thru the employment of ingenious conveying machinery. STEPHENS-ADAMSON is a chief contributor to the science of bulk materials conveying by developing concepts and equipment in general use today by metal, coal and mineral miners throughout the world.

Heading a long list of outstanding S-A engineering achievements is the first ball bearing belt conveyor carrier which made the long distance belt conveyor feasible. It opened the way for the most practical, lowest cost method of bulk material transportation ever conceived by man. The magnitude of this accomplishment is scarcely measureable in our era of high-speed production and insatiable demand for raw materials. As an appropriate sequel, S-A followed up by designing and building the longest underground belt conveyor system in the world!

STEPHENS-ADAMSON has earned its big name the hard way — with engineering skill — by building quality equipment for 57 years. That's why, if you have a conveying problem, your interests will be served best by the men who know conveying best — the men from S-A.



Car dump discharges ore to a grizzly which permits minus 5" ore to fall directly to this 72" wide AMSCO manganese steel pan feeder. STEPHENS-ADAMSON builds feeders in any practical width or length to handle any size ore lumps.

This S-A belt conveyor system operates at the 1200 foot level of a Menominee Range mine. It is the second of two similar conveyor systems installed since 1946. The 36" wide belt rides on S-A carriers. Capacity of the system is 250 T.P.H. with a belt speed of 200 F.P.M.

This 1200 foot long inclined S-A belt conveyor delivers primary crushed ore to storage at a secondary crushing plant. Belt is 48" wide and total lift is 190 feet. Headshaft is provided with an S-A hold-back to prevent belt reversal under load in case of power failure.

One of the finest ore unloading docks in the nation is at Curtis Bay, Md. The conveying system was engineered and built by S-A. Ocean-going vessels are unloaded and their cargoes delivered to waiting rail cars. Belt conveyor carries material almost 900 feet to car loading station.

-ADAMSON

EQUIPMENT

S-A district or main plant offices can supply complete information on any conveyor product or any phase of ore handling. Just write or call.

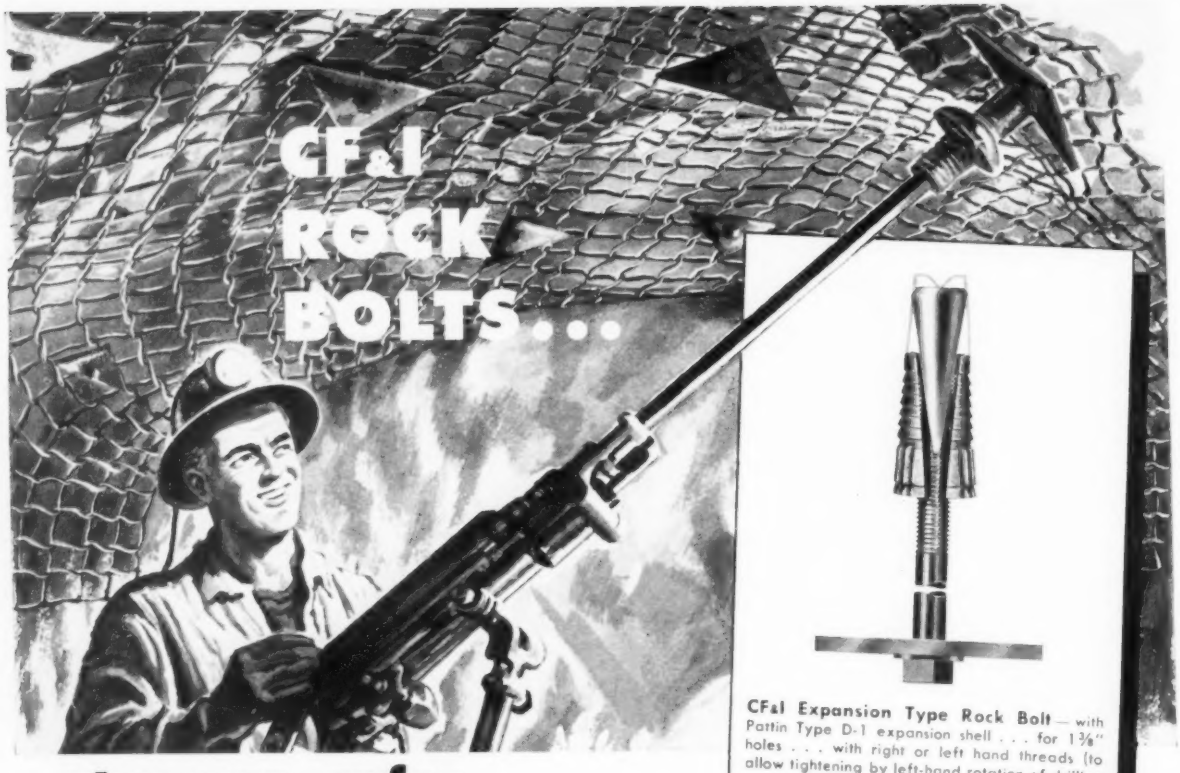
S-A

STEPHENS-ADAMSON MFG. CO.

MFG. CO.

MAIN OFFICE AND PLANT
13 RIDGEWAY AVENUE
AURORA • ILLINOIS

PLANTS LOCATED IN: LOS ANGELES, CALIFORNIA
CLARKSDALE, MISSISSIPPI • BELLEVILLE, ONTARIO



CF&I Expansion Type Rock Bolt — with Pattin Type D-1 expansion shell . . . for 1⅜" holes . . . with right or left hand threads (to allow tightening by left-hand rotation of drilling machines). Also available, the Pattin D-5 shell for use with ¾" and ⅞" bolts in holes of 1⅝" diameter . . . and CF&I Slot-And-Wedge Type Rock Bolts.

stronger, safer, space-saving support... AT LESS COST

strength—when anchored in mine roofs or walls, CF&I Rock Bolts provide maximum resistance to load with a minimum of displacement. Pattin expansion shells double the usual shell expansion, grip twice as hard.

safety—high strength steel, (to American Standard Specifications for Roof Bolting Materials sponsored by American Mining Congress), provides ample factor of safety...fully safety-tested...proven in use throughout widespread applications...CF&I Rock Bolts eliminate the danger of timbers bending or buckling under load.

space-saving—cumbersome, space-consuming timbering methods may be unnecessary. CF&I Rock Bolts permit maximum utilization of available work space and ventilation facilities.

cost-saving—less bulky, easier to haul and install than heavy timbers. When used with Realock Metallic Fabric for lagging, CF&I Rock Bolts offer proved initial-cost savings up to 35% over timber sets.

OTHER CF&I PRODUCTS FOR THE MINING INDUSTRY

CF&I Grinding Balls • CF&I Grinding Rods • Wickwire Rope • Mine Rail and Accessories • CF&I Industrial Screens • Realock Metallic Fabric

***ALSO,* for your convenience,**
CF&I SLUSHER PINS

When you make your own slusher pins, the cost may be high and you may not get the best possible results. As a customer service, CF&I makes available Slusher Pins made to the same high standards of quality, performance and minimum cost as our Expansion Type Rock Bolts. Modified CF&I Rock Bolts also make excellent hangers for such equipment as air and water pipe, electrical cable, vent tubes and ventilating fans.

CF&I Slusher Pin — consisting of a ¾" bolt threaded at one end, and a 2¾" I.D. eye formed and welded on the other end. These are anchored in 1⅜" diameter holes by means of Pattin Type D-1 expansion shells, and successfully withstand the pull from slusher drums.

A 20-min. Rock Bolting color movie "Make Mine Safety" is available for showing, through the offices listed below.

THE COLORADO FUEL AND IRON CORPORATION

Albuquerque • Amarillo • Billings • Boise • Butte • Chicago • Denver • El Paso • Ft. Worth • Grand Junction • Houston
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6276

Mining World

THE IMPORTANT MINING MAGAZINE EVERYWHERE

December 1958

INTERNATIONAL PANORAMA

DARWIN, AUSTRALIA—A joint Australia-New Zealand geological survey team has discovered low-grade phosphate deposits on Bellena Island in the British Solomon Islands.

WENATCHEE, WASHINGTON—The Old Buckhorn magnetite mine is to be reopened by Western Stevedoring Company and Pacific Quarries Limited of Vancouver, British Columbia. Iron ore will be mined and shipped to Canada for milling with concentrates shipped to Japan.

QUEENSTOWN, CAPE PROVINCE, UNION OF SOUTH AFRICA—Gold reportedly has been discovered 50 miles north of here. Nearest previously known gold deposits are at Mount Ayliffe 150 miles to the east.

RAY, ARIZONA—Kennecott Copper Corporation's Ray Mines Division continues on a major expansion program with start of construction for ore loading bins, crushing plant extensions, and flotation mill additions to raise capacity to 22,500 tons per day at Ray and Hayden.

JEFFREY CITY, WYOMING—Fremont Uranium Corporation has developed a new uranium district 30 miles southwest of the Gas Hills district. Shallow ore bodies are being mined by open pitting.

CARLSBAD, NEW MEXICO—International Minerals and Chemical Corporation, the only commercial producer of langbeinite in the world, has just mined its 10,000,000 tons of this ore.

ANCHORAGE, ALASKA—Iron ore has been found by drilling a geophysical anomaly outlined by Humble Oil and Refining Company in the Dillingham district.

COPIAPO, CHILE—Mitsubishi Metal Mining Company is forming a new company to develop, mine, and ship iron ore to Japan from the Las Andrianitas deposits. Shipments eventually will reach 1,000,000 annual tons with 1960 shipments set at 325,000 tons.

BUTTE, MONTANA—The Anaconda Company has reopened its Anselmo zinc mine and increased production at the Mt. Con and Berkeley copper mines by working six days per week.

FRIEND'S STATION, TENNESSEE—American Zinc Company of Tennessee's Young Zinc mine has produced its 1,000,000th ton of ore. Daily production is planned to be 4,000.

MOAB, TAH—Standard Uranium Corporation's recent exploration program at the south end of its Big Buck mine has developed an estimated 300,000 tons of high-grade ore.

BINGHAM CANYON, UTAH—Kennecott Copper Corporation sold 390,900 tons of copper in first nine months this year and produced only 357,400. To increase output the Utah, Chino, Nevada, and Ray divisions have been placed on a seven-day production week.

KELLOGG, IDAHO—The Bunker Hill Company plans to build a $10,000,000 fertilizer plant to utilize Bunker Hill's sulphuric acid and western phosphate rock to produce a variety of phosphate fertilizers. The 200,000-ton annual plant is scheduled for production by July 1960.

BAGUIO, REPUBLIC OF THE PHILIPPINES—Itogen-Suyoc Mines produced a record tonnage of gold ore—19,319 tons—at its Itogen mine in September.

LA PLATA, COLORADO—Bear Creek Mining Company has located 30 copper claims in the La Plata Mountains to cover a large deposit of copper. Bear Creek is Kennecott Copper Corporation's exploration subsidiary.

GRAND RAPIDS, MINNESOTA—Jones & Laughlin Steel Corporation is building an 800-long-ton-per-hour iron ore concentrator at its Lind-Greenway mine.

Bear Creek Stakes Arizona And Colorado Cu Claims

Bear Creek Mining Company's field geologists and land crews have been busy during the last three months staking copper claims near Wickenburg, Arizona, and in the La Plata Mountains near La Plata, Colorado.

In Arizona some 200 claims were located about 14 miles from Morristown on the Castle Hot Springs Road. Company engineers and geologists headed by Ray Robinson of Tucson have made geological and geochemical surveys. Several types of geophysical surveys are being made to correlate geological findings. Both igneous rocks and pre Cambrian basement crop out in the area under investigation. These claims are believed to be within a few miles of where Cerro de Pasco Corporation found copper sulphide mineralization along and near the contact of schist and intrusive igneous rocks.

The Colorado claim staking in the California mining district of La Plata County was directed by Ray Gilbert, Bear Creek's Denver exploration division. More than 600 acres have been staked and geological and geophysical surveys made.

While the district is best known for the high grade gold-silver ores mined at the May Day Gold King, Bessie G, and Idaho mines, disseminated bodies of platinum-bearing chalcopyrite have been found and are believed to be of more interest to Bear Creek than the gold veins and replacement bodies.

Bunker Hill Will Build Phosphate Fertilizer Mill

The Bunker Hill Company is planning to build a 200,000-annual-ton fertilizer plant in the northwest, probably in south central Washington. Production is scheduled for July 1960.

This is a logical expansion by Bunker Hill to utilize low-cost sulphuric acid produced from roaster gases at the firm's lead and zinc smelters at Kellogg, Idaho. Present acid plant production of 100,000 annual tons can easily be increased by utilizing all smelter gases for acid.

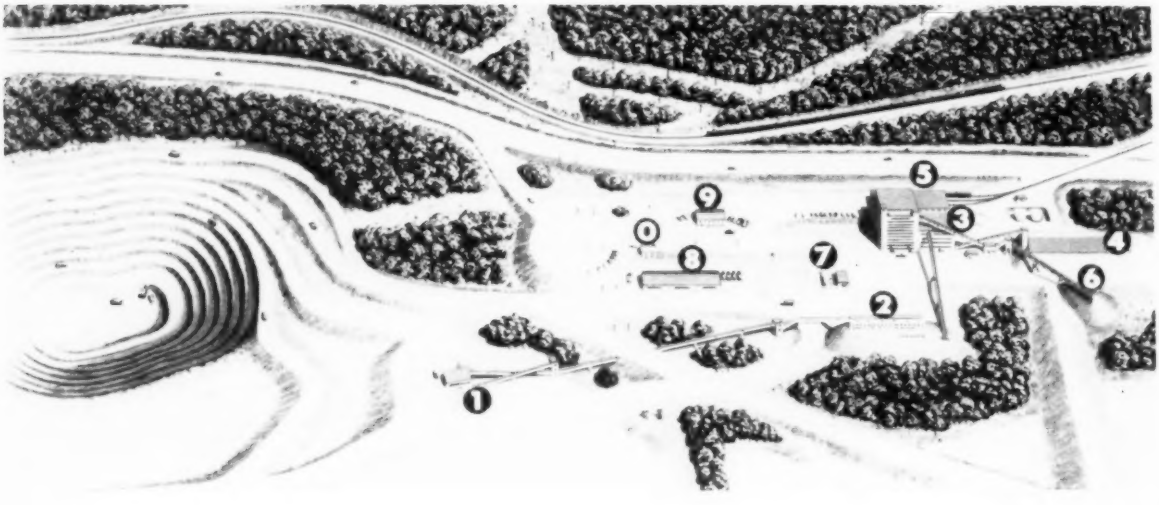
The new plant will manufacture a wide variety of phosphate fertilizers initially using a variety of purchased western phosphate rock and concentrates. The Bunker Hill geological staff has been checking phosphate deposits and it is very possible that Bunker Hill will get into phosphate mining for the new plant if a suitable ore body can be discovered and controlled by the firm.

John D. Bradley, president, has announced that William G. Hewitt, recently hired as a marketing analyst, will play an important part in the new fertilizer program.

In January – How Western Gold Mines U_3O_8 in Grand Canyon

Lake Asbestos

ASARCO Opens a New Mine and Plant



But Only After . . . . . .

- Black Lake was moved into new, man-created basins
- Becancour River which fed and drained the lake was shifted into new, wider channels
- Four Dams were constructed for flood control purposes
- A highway was built to replace the road around the lake
- And 27,000,000 yards of lake bottom was dredged

Lake Asbestos of Quebec, Ltd. dedicated new open pit and milling facilities at Black Lake, Quebec, in October, capping a $36,000,000 project which extended over a 4 year period. The new mine and plant will produce 100,000 tons of fiber per year, and this will contribute about 10 percent to Canada's output of this essential raw material. Shakedown runs at the mill began on July 1, 1958. Today the plant is operating on a fully commercial basis.

The project is unique in that the ore bodies were under a lake which was the key feature in the drainage system of a populated area. Readying the deposits for open pit mining ultimately will involve removal of about 37,000,000 cubic yards of overburden —30,000,000 cubic yards by dredging and pumping, and 7,000,000 yards by power shovels and trucks. The enormous amount of mud, silt and glacial till to be dredged, control of drainage during dredging, the need to cope with drainage problems in the area and to provide for flood control to replace the regulating effect of the lake, posed unusual engineering problems and required a tremendous capital investment.

The development is an outstanding example of international cooperation whereby Canadian natural resources are being brought into use for the benefit of Canada through the investment of American capital and the utilization of the engineering skills of both nations. Under the agreement by which Asarco undertook the venture in conjunction with United Asbestos Corporation, Ltd.–the company holding mining rights to the Black Lake deposit–Asarco is to supply the necessary capital for the development of the property and operate it for the life of the ore bodies on a profit-sharing basis.

The Province of Quebec, where Black Lake is located, produces about 60 percent of the world's asbestos fiber. Just north of the "lake," which was about 2 miles long by a half-mile wide, is the town of the same name, Black Lake (population, 5,000), and 4½ miles further north is the town of Thetford Mines (population, 20,000). In this Thetford Mines-Black Lake mine district, production of asbestos is the principal industry; there are seven mines and mills in the area, and huge tailings piles give evidence of long years of working these deposits. Another principal mine district is some 45 miles to the south, at Asbestos.

Since asbestos deposits have been mined on either side of Black Lake for many years, it was a reasonable assumption to expect that the ore extended under the lake. Until a few years ago, the tremendous engineering problems and costs involved in developing such submarine deposits precluded exploration under the 500-acre lake. However, the success of the draining and dredging operations to recover iron ore from deposits in the Steep Rock area in Southern Ontario (near the Minnesota border) made the Black Lake potential seem more favorable to Canadian engineers. Consequently the area covered by Black Lake was staked January 1, 1948, and, with mining rights granted by the Crown, the first test hole was

in Quebec

NEW FACILITIES include: 1. Primary crusher; 2. Wet rock storage; 3. Dryers; 4. Dry rock storage; 5. 14-story mill; 6. Tailing conveyor and disposal; 7. Power substation; 8. Shops; 9. Offices; 10. Change house.

DOWN THE HOLE drill rig is used for blasthole work. Secondary blasting is done with Travel Drills.

A PUDDLE is all that remains of Black Lake today after 55,000,000 gallons of water and the overburden were removed. The mine is expected to produce about 1,350,000 tons of ore per year. P&H shovel and Euclid trucks are shown above.

drilled in August of that year. Exploration was carried on during the winter months by drilling with drill rigs set on the ice. At this time, the United Asbestos Corporation Ltd. was formed and funds were obtained through public subscription to carry on this work.

A 6-foot by 16-foot shaft was started on the east side of the lake for underground exploration in 1950 and completed in the spring of 1951 at a depth of 570 feet from the shaft collar. Underground development followed as tunnels and drifts were drilled to explore this deposit, known as the "A" ore body. Another ore body, known as "C" ore body, was located beneath a granite island on the west side of the lake. A third ore body is indicated in the center of the lake, but this needs further development, and only the two ore bodies figure in present plans.

United Asbestos, most of whose shares are owned by Canadians, had invested $1,000,000 to $2,000,000 in exploration operations, but did not have the tremendous capital needed to bring the property into full production. Seeking financial and engineering aid, it brought the development to the attention of Asarco. United Asbestos granted Asarco an option to provide the necessary funds for development of the property and operate it on a profit-sharing basis.

Following checks on the exploration already done, further drilling, and actual milling of ore to determine yield, value, type of equipment needed for the job, etc., Asarco exercised the option in May, 1954. By this time some 120,000 feet of diamond drilling, part surface and part underground, has been carried out, and 30,000 tons of ore had been mined for pilot plant testing. The existence of deposits sufficient for 20 years open-pit operations had been established.

Construction Aggregates Corporation of Chicago, the company carrying on the Steep Rock dredging, was granted the contract for dredging. CAC's contract called for construction of a suction dredge to remove the silt from the lake bottom, and to drain the lake prior to the start of open pit mining of "A" and "C" ore bodies. Open pit mining was selected over underground mining on the basis of the geology of the area and other factors. But in either case, it would have been necessary to remove the mud and silt to guard against contamination of the asbestos by organic matter that would char at the high curing temperature employed in asbestos processing, and degrade the product.

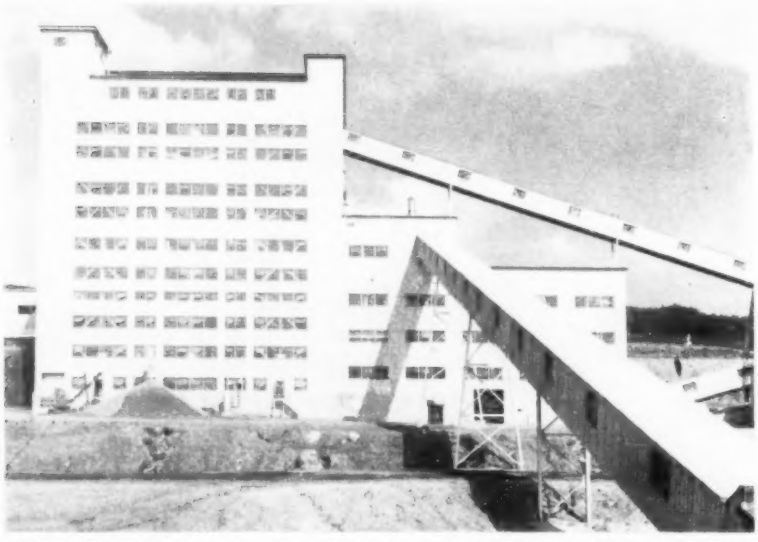
Although dredging will continue until early 1959, the lake was low enough in mid-1958 to permit the start-up of mining and of tune-up operations in the mill. Open pit mining should be possible for about 20 years; after that underground methods will probably be necessary. Ore reserves are presently estimated at 42,000,000 tons.

Prevention of contamination is very important in asbestos mining and milling. the ore body must be carefully cleaned before it is blasted, crushed, and milled. Workers even have to go into compounds set aside in enclosed areas of the mill for a smoke.

The ore being mined at present is from two of the three known ore bodies under Black Lake. The standard method of mining is by quarrying in 40-foot benches.

One ore body starts at an elevation 630 feet, the other at about 670 feet. Original lake level was at 750 feet; now is about 620 feet; and will be at 530 feet when completely drained. Open pit operations will go down about 300 feet, and then may be extended another 300 feet, by underground methods.

Primary blast holes are drilled 6¾-



MILL BUILDING is 130 feet high, 260 feet long and 150 feet wide. The $9,200,000 plant was built by F. H. McGraw Co. of Canada Ltd. It features automatic remote control of mill feed, multistage fiberizers and multistage graders.

in. diameter. They are spaced at 10 to 15 feet with a burden of 20 to 30 feet. Secondary blasting and block-holing is done by tractor-mounted wagon drills and by Travel Drills. Ore is loaded into 25-ton capacity rear-dump trucks by 4-cubic-yard capacity shovels and dumped into a 100-ton capacity steel hopped type chute.

Major considerations in plant construction were prevention of contamination and strict quality control measures. Primary function of milling is to separate fiber from the serpentine host rock. Ore is crushed to minus 2 inches in two stages. A 120,000-ton wet storage pile ahead of the drier section permits blending of ore from the two pits, also provides surge capacity for the treatment plant. Third stage crushing, drying, milling and finished fiber warehousing are all in the same building. Automatic feeders operate under both dry and wet storage.

Air separation is the most important unit process in mill. Dry crushed ore passes over shaking screens equipped with powerful air suction hoods. Vibration screens out sand, while fiber rises through the screen bed until removed as the ore travels under the hood. Screens are kept from blinding by rubber balls under the screen surface. These bounce against the underside of the screen or perforated plate. Aspiration from screens is accomplished by exhausting air from the top of cyclone collectors through a bag filter chamber at the top of the mill.

Minus 2-inch feed to the mill is delivered to three identical rock lines. It undergoes third-stage crushing to ½-inch, then is passed over a shaking screen equipped with a suction hood to remove the fiber. Oversize and undersize from this screening report to a fiberizer which breaks the rock by impact in high-speed Hazemag hammer mills. The hammer mills have a more severe action than the crusher, hence they are not used until the longer, more valuable fibers have been removed. Ore from the fiberizer is fed to shaking screens where fiber is pulled out by suction.

Asbestos is cleaned and graded by feeding the fibers to cyclone collectors. The heavier fractions, comprising locked fiber and rock, fall vertically; air suction draws the lighter asbestos fibers off sideways to be graded according to length by passing through flat or rotary screens.

The grading screens have three sections, each of which is covered with a wire cloth of a different mesh. Fibers fed into one end of the screen are agitated by revolving paddles which force the short lengths through the screen of the first section and eject the longest grades at the end. Each grade falls on a flat cleaning screen where sand, dust and unmilled splinters are removed.

Waste from all screening operations, normally about 90 percent of the original ore, is conveyed to tailings dumps. One of the unique features of the Lake Asbestos mill design is that approximately 35 percent of the original feed can be rejected to tailings after the third screening operation. This relieves the third and fourth stage milling machines of a considerable load and minimizes sand, dust and rock powder.

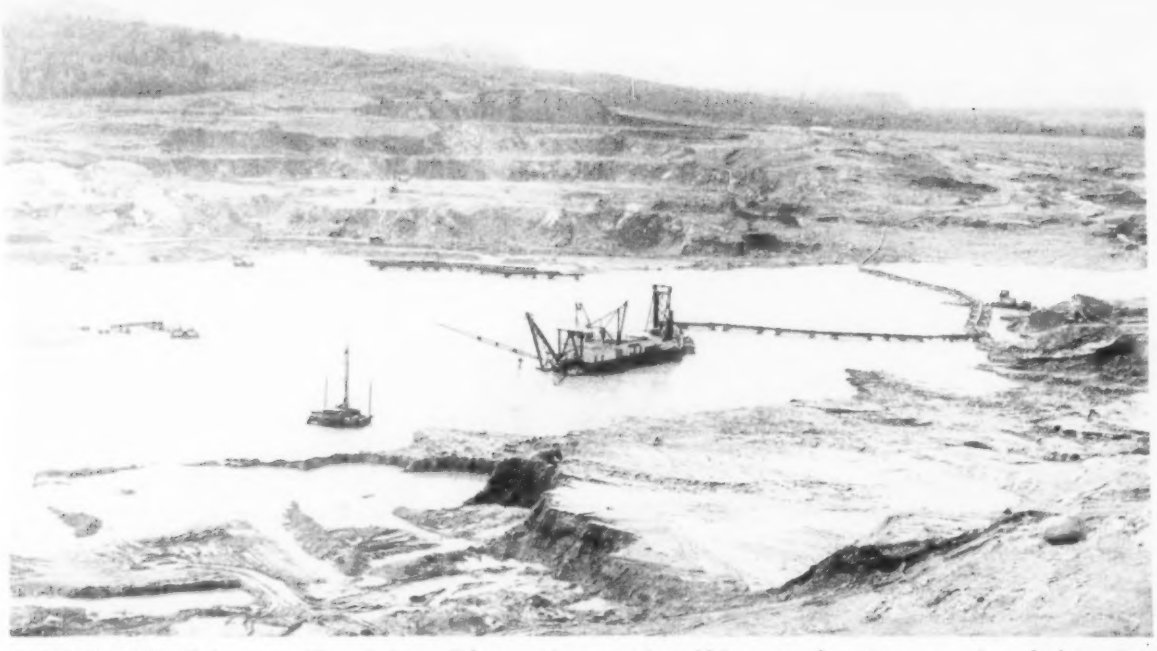
The fiber, after blending in the graders, is screened and lifted into cyclone collectors which discharge into finished fiber bins. There are fourteen such bins. The different standard grades—spinning (Group 3), shingle (Group 4), paper (Group 5), stucco and plaster (Group 6), and shorts (Group 7)—are collected in the bins.

Why ASARCO Participated in Black Lake Development

Profit was the primary motivating force behind ASARCO's decision to undertake development of the Black Lake deposits. But there were other important reasons. Black Lake offers ASARCO a raw material product that is less cyclical than non-ferrous metals. A further advantage is the relatively steady price of asbestos. These facts will lend greater stability to ASARCO's sales pattern. To ASARCO the entire project was a challenging opportunity to put its capital and engineering resources to work in a new field. The program for developing the asbestos deposits represents a major step toward further diversification of ASARCO's industrial interests.

In entering this field, ASARCO will continue its basic company policy of supplying raw materials to industrial consumers. ASARCO will not itself make asbestos end-products. This will give it a sales advantage over many other basic asbestos producers who are also large factors in the asbestos products industry as well. In contrast to such captive production, all the Lake Asbestos output will be available to industrial users.

The consumption curve of asbestos forms an interesting background. Use of asbestos products has been growing and is expected to continue along this line in the future. Black Lake asbestos is of high quality say company officials. In terms of return to the company, it is indicated that the average price of fiber produced will be about $130 per ton. This will yield a gross annual return of $13,000,000 based on 100,000-ton yearly production.



SUCTION DREDGE, known as Fleur de Lis, will have paid for itself when the job is finished, say engineers, because they calculate that mechanical removal of the same amount of material would have cost three times as much as dredging. It is likely that other work will be found for the dredge elsewhere; it can be dismantled and shipped.

Lake Asbestos

How The Hydraulics Problems Were Solved

Although Black Lake is inevitably compared with Steep Rock, which is a larger job, it stands alone. Not only is it the first to employ suction dredging to uncover asbestos ore, but it is also unique in the complexity of hydraulics problems involved. The Black Lake area has an annual rainfall of 44 inches, compared with about 20 for Steep Rock. It is a more populous area than Steep Rock so that the effect of alterations in drainage patterns on existing towns, and other factors involving settled areas, had to be considered. The material on the side of the lake is soft and has to be carefully terraced to protect the mining pit from the slides, whereas at Steep Rock an area with solid rock on either side has been gouged out.

The towns of Thetford Mines and Black Lake are in the valley of the Becancour River which drains a 40-50 square mile area. The river originally flowed into and out of Black Lake in its route to the St. Lawrence River 75 miles away. With the lake to be drained eventually, the Becancour River had to be diverted as a first step. This was accomplished by digging a new river channel, 8,000 feet long, which by-passes the lake across the north side. The new channel is generally 70 feet wide, but at the upper end a pond area (4,000 feet by 500 feet) prevents back water from raising the level of the Becancour upstream during flood stages. Just below this diversion channel, the Becancour had to be widened and deepened and a dam built to control the flow down the river.

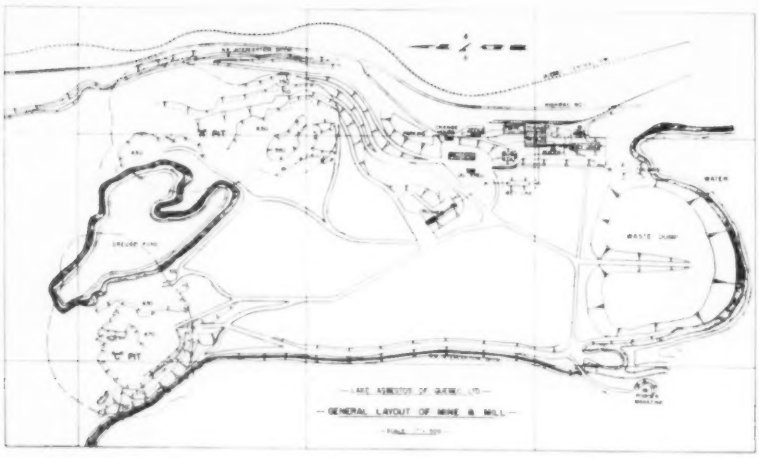
About 6 miles further down stream, before the Becancour enters Trout Lake, a second dam was constructed. It regulates the flow of the Becancour downstream during flood stages by forming another flood plain area to compensate for the removal of Black Lake from the water circuit.

At its south end, Black Lake had a narrow neck originally 142 acres in size, serving a drainage basin of 8-10 square miles. This neck was dammed off and the overflow water is diverted from South Neck Dam to the river by a channel which also intercepts runoff waters from the hills. South Neck is now a storage basin, about 300 acres in size, but it will become smaller as it is filled in with excavated material and eventually with tailings rejected from the mill.

In addition to the drainage ditch running from South Neck, ditches had to be provided all around the lake to intercept surface runoff and carry it to the river channel. All the diversion and drainage structures were designed to handle maximum runoff—which can amount to seven inches of rain in a 24-hour period.

An integral part of the hydraulic system is the disposal of waste, including that from the dredging operations. Not only must there be areas to deposit the silt as it is pumped out, but water from this mud and silt slurry must be returned to the lake to maintain a water level needed for dredging. If needed, additional water can be diverted from the river channel through a control gate and canal system. Conversely, when the level of the lake must be lowered, water is wasted to the river channel instead of being returned to the lake.

The main waste disposal area is about three miles west of the lake. This area, with a maximum length of about 6,700 feet and maximum width of about 4,700 feet, has a capacity of about 25,000,000 cubic yards of ma-



How waste dump and ditch intercepts were laid out.

terial. Two other disposal areas are on the opposite sides of the diversion channel at the north end of the lake. All are diked off; three dams, for example, having been built at the main disposal area as part of the dike system. These are 70-80 feet high at the highest point and have a 200-foot wide top and a base that is about 1,000 feet wide at its widest point.

Decantation towers in these areas carry the water from pumped mud and silt, back to the lake via return ditches. The open steel post frame of these towers is gradually closed with timber stop-logs as the level of the water rises. Water free of mud and silt continually flows in toward the tower from the pool where the dredge pipeline is discharging, and the water, being at a higher level than the barrier logs, flows into the tower and down pipelines located at the bottom of the tower and running to the ditch. These pipelines have to be vented since air is trapped in the tower as the water flows down.

In addition to changing the drainage of the area, Highway No. 1, running along the east side of the lake, had to be moved to make way for the project. This involved replacing the old highway with 1.9 miles of class A highway having a 46-inch subgrade and 22-foot wide paving. The cost was $364,000, of which Lake Asbestos paid 90 percent. The Quebec Central Railroad, which passes the property on the east, did not have to be disturbed, however. A spur has been brought into the property.

The dredge which CAC constructed for Lake Asbestos, was brought in eleven sections and assembled on the site. Its dimensions are 140 feet-by 40 feet and its weight, about 200 tons. Powered electrically, it has a 75-foot cutter and suction ladder. The cutting head is 7 feet in diameter, 8 feet long, and has special alloy steel teeth welded on a spiral cutting edge. This cutter fits over the suction end of the pipeline and dislodges lake-bottom material in place so that it can be removed hydraulically. The cutter is driven by an 800 horsepower motor; a reduction drive reduces the revolutions of the shaft and head from 900 revolutions-per-minute to 24 revolutions per minute.

The suction pump on the dredge is a 30-inch centrifugal pump powered by a 6,000 horsepower motor. The giant pump is about 10 feet in diameter. To prevent large boulders from entering the pump and jamming it, there is a jaw crusher (20 inches-by 36 inches) in the suction line. The crusher is completely submerged, making it an unusual installation. It smashes large boulders into pieces small enough to pass through the pump (18 inches diameter or less).

The material is pumped out in a pipeline and carried across a pontoon line originally 3,200 feet long. This dredge pipeline is of welded steel, 32 inches outside diameter and has a ⅜-inch wall. Each 50-foot length weighs 6½ tons. The pipeline along the shore is also 32 inches outside diameter, but it has a ½-inch wall, and each 50 foot length weighs 4 tons. The heavier pipe was not deemed necessary on shore where ruptures would not be as difficult to repair. There are some 25,000 feet of shoreline pipe carrying dredged material to the disposal areas. In addition, Lake Asbestos has 4,000 feet of supplementary pipe.

The dredge pump, which has a capacity of about 35,000 to 45,000 gallons-per-minute, can be used to pump water through a 12-inch diameter hydraulic monitor which throws a powerful stream up on the slopes of the lake basin. Soft clays and other material are washed into the lake in this operation where they can be easily removed by dredging. Some of this slope material would be difficult, if not impossible, to haul away mechanically. The suction dredge is used only occasionally for monitoring; it is augmented by two full-time monitoring barges equipped with smaller pumps.

In addition to the dredge pump, there is a 30-inch booster suction pump powered by a 6,000 horsepower motor located on the shore. Another half mile along the pipeline there is a second booster station with a 30-inch pump powered by a 2,500-horsepower motor.

These giant pumps were all originally constructed with standard steel casings, but alloy steel had to be substituted to withstand the abrasion of the rocks and mud that continually bang along the line. At least four have already been worn out on the job; and normally two or three are being rebuilt at all times.

The dredge in one position can swing about 250 feet, cutting a bank 250 feet-by 30 feet-by 8 feet. It will cut a bank of that size in about 40 minutes if the material is soft, in about an hour if it is otherwise. The dredge is moved by swinging on one of its spuds—iron cylinders mounted at the rear which are used for maneuvering. The operator walks the dredge by letting each spud down alternately, then swinging on it.

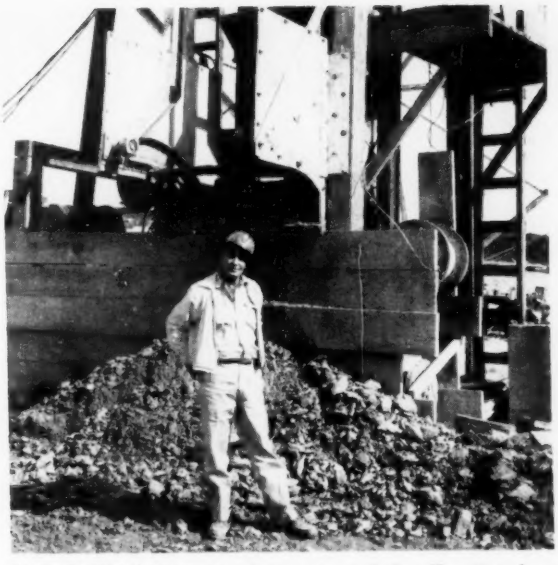
Rate of removal depends on the material dredged—sand, loose mud or boulder clay. The dredge can pump 1,400,000 cubic yards per month in very soft overburden; the minimum is 400,000 cubic yards per month; the average, 1,000,000 cubic yards per month. In one 24-hour day a top performance of 79,000 cubic yards was removed. The material's average composition is about 17 per cent solids, so that the quantity of slurry passing through the pipeline is about 35 to 45,000 gallons-per-minute.

The dredging plans were charted to establish a terraced contour, with various cuts arranged to create slopes and to protect the open pit against mud slides. This is accomplished by controlling the lake level carefully through the hydraulic system.

Other marine equipment used at Black Lake includes: a cable reel barge that pays out or reels in the submarine power cable; two icebreakers which permit operations in sub-zero weather; a derrick barge to handle lines and heavy loads; a small moniter barge for washing down slopes; a drill barge with compressed air drills for loosening dense overburden; and a large pump barge with 5,000 gpm pump to lower the lake level.

THE END

GENERAL MANAGER, Tommy Newell, proved that crew could sink Thomas Bardon shaft faster than nine feet per day. He saw need for new equipment and had courage to use it.



SUPERINTENDENT, Frank Garrett, at shaft collar. Note how skip is dumped on ground close to collar to save travel time. No bins or chutes are used as bulldozer spreads muck.

Shattuck Denn Sinks Bardon Shaft 16.3 Feet Per Day With New Jumbo and Cryderman Mucker

"We will strive to exceed nine feet per day working three shifts per day sinking the Tom Bardon shaft." This was the schedule Shattuck Denn Company's vice president and general manager Thomas W. Newell, hoped to achieve when he planned the company's new uranium mine in Utah's Big Indian district.

With careful planning, a modern surface plant, the use of a new drill jumbo and sinking skip, a good shaft crew, and some luck, Tommy and his staff kept his word.

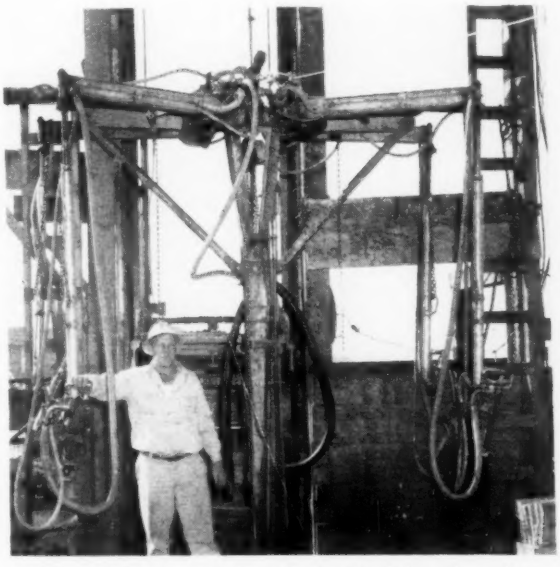
Here's the record for the best 25 days' progress. On 15 September, the shaft was 110.0 feet deep; the initial equipment bugs had been corrected, and the crew broken in. During the 15 days to the end of the month, 245 feet of shaft were completed for an average advance of 16.3 feet per day. In the first 10 days of October, 147 feet were completed at a rate of 14.7 feet. During the 25-day period, 392 feet of shaft were sunk—an average of 15.7 feet per day. Not too fast, compared with the South African and monthly world record of 834 feet in September 1957, and very close to the Canadian record of 406 feet in a full 31 days of May 1957 at Milliken Lake Uranium Mines, Limited. The United States record of 427.5 feet set 38 years ago at the Water Lilley shaft at Eureka, Utah still stands.

At 502-feet depth on October 10th, the shaft hit water at the contact of the Wingate and Chinle formations. Sinking stopped for three days to install a water ring, mud ring and pump. Necessary dead work and repairs were also completed. The next 300 feet of shaft will be in heavy bentonitic Chinle shale where sinking was scheduled at 13 feet per day. Depth on October 28 was 600 feet.

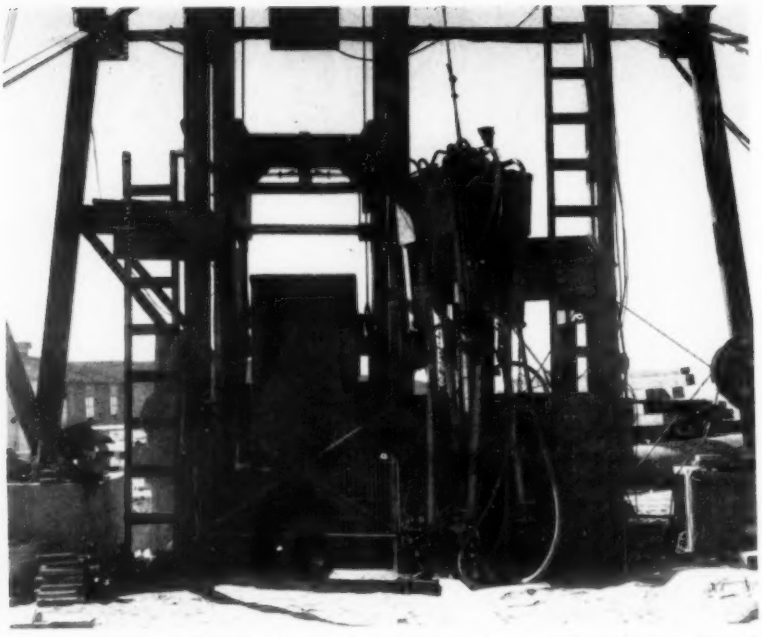
Only Three Men In Bottom

All the more remarkable is the fact that only three men per shift are used in the bottom of the 7-by 14-foot shaft. In addition, there are a hoist man and top man each shift. With careful planning and adequate time for preparation, all shaft timber was framed and stacked near the collar and other necessary supplies stockpiled before sinking was started.

When Shattuck Denn's local management—Tommy Newell, vice president and general manager; Frank Garrett, superintendent; Earle Apeland, engineer; and Leo Zitnick, mine foreman—planned to sink the 830-foot Bardon shaft



MINE FOREMAN, Leo Zitnick, checks drill and jumbo on surface. Note one of two air cylinders (top left) of jumbo which are used to hold it in place at bottom against rock.



JUMBO IS COLLAPSED to this small diameter so that it may easily pass through one compartment of shaft when hung under skip. It is hung from headframe as shown during mucking and timbering. Drills are hooked on surface between rounds.

through which to develop and mine a uranium ore body, they were convinced that a faster method could be developed for lower cost sinking. The staff, in close cooperation with Shaft and Development Machines, Inc., Machinery Center, Inc. of Salt Lake City, Utah, and Atlas Copco Pacific, Ltd., San Carlos, California, developed a folding compact retractable airleg drill jumbo, a rectangular safety sinking skip, and mounted a ventilation fan in the cage of the Cryderman mucker to make fast sinking possible. These new pieces of equipment dramatically proved their worth on their first job.

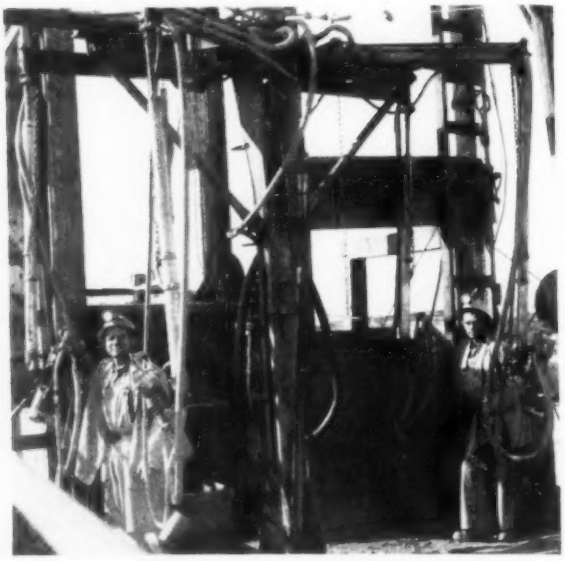
The first 80 feet of the shaft, in the Kayenta formation, were mucked with a clamshell bucket swung from a truck mounted crane on surface. From 90 to 502 feet, the shaft cut the Wingate sandstone which made 25 gallons of water per minute at the 400-foot point. From 502 to a depth of 810 feet, the shaft is in Chinle shale to the top of the 20-foot-thick, ore-bearing, Shinarump sandstone.

In open circular shafts, drill jumbos have been successfully used, but in rectangular shafts, because of limited compartment size, it has been a problem to devise a fast setup jumbo that would supplant the conventional jackhammer drilling.

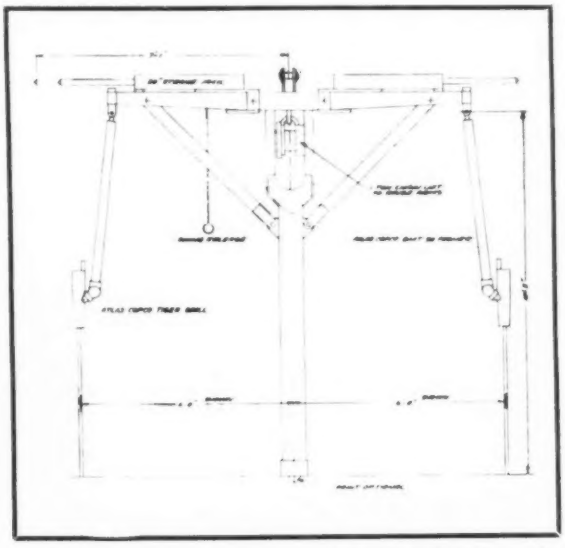
The new airleg jumbo, supporting four Atlas Copco "Tiger" drills with retractable legs, is a compact unit. Line oilers, air and water hoses are permanently mounted on it. When collapsed, it will pass through a 48-inch opening, yet can be easily and quickly set up for drilling. Operating like the spokes in an umbrella, the two ribs are raised by a chain hoist to bring the drill-supporting sections into a horizontal position. Extending from the top of these sections are two air cylinders which extend 30-inch-long anchor rods into the rock at each end of the shaft. The jumbo is transported through the shaft by a cable attached to the bottom of the sinking skip. Total setup time, from surface to a depth of 450 feet, was eight minutes.

The leader of the three-man shaft crew operates two drills, while the other two miners each handle a machine to drill the 34- to 36-hole, six-foot, end-cut round. The horizontal arm supporting the drills has two fixed positions which give the machines great flexibility for movement anywhere in the shaft.

In the Wingate and Chinle formations the Coramant 1-inch hexagon integral steel with chisel bits gave a fast penetration rate. Very importantly



JUMBO IS EXTENDED for drilling out round. Note steel rack and Atlas Copco sump pump attached to center post. Miners are from left: L. A. Millsop and G. B. Pratt.



ATLAS pusher legs are key unit for fast drilling from this jumbo. Upper end is fastened to jumbo frame through swivel joint as shown. Leg is retracted to pull steel from hole.

the 300-pound pull of the retractable Atlas airleg eliminated miner's fatigue normally caused by pulling drills from the holes.

On completion of the round, the jumbo is dropped into the collapsed position and easily hoisted to surface. Over-all drilling time from the moment the unit leaves surface until it is returned is one hour.

Electric caps with 10 delays are used to fire 1½- by 24-inch gelatin powder. Two bus wires shaped in a "U" are anchored in the shaft bottom for parallel firing.

After loading the round, which takes one-half hour, the crew coming up the shaft start the fan mounted on the deck of the Cryderman cage, then go to surface and fire the round. Five minutes after the blast, the men return to the bottom and resume the sinking cycle. This is possible only through use of the efficient ventilation system.

New Ventilation Method

A 4,500-cubic-foot-per-minute axivane fan is mounted on the top deck of the Cryderman mucker, with a metal vent tube extending completely through the cage to the operator's deck. The Cryderman is generally raised 40 feet above the bottom for blasting, so great air turbulence is created by the fan blowing in the shaft bottom. The 7,500-cubic-foot-per-minute fan mounted on surface has an 18-inch vent line extending down the shaft and ending below the blowing fan on the Cryderman cage. Recirculation is avoided by keeping the bottom of the suction line below the blowing fan on the cage. A 10-foot upright vent pipe is placed on the exhaust end of the surface fan to keep exhaust smoke from being drawn into the open shaft. By observing the discharge end of this upright pipe, the miners can tell when the shaft is clear of smoke. This interval, or "smoke time," is not more than five minutes.

Safety Sinking Skip

Loss of time dumping the conventional round sinking skip with the ball and chain was the main reason for developing a square, 70-cubic foot skip whose shape gives a greater volume in the five-foot compartment. Its action on surface is like the conventional production skip in that no surface delay occurs as the skip goes into the dumping scrolls, discharges its load, and is quickly lowered to the shaft bottom.

The main hoisting cable is attached to a bridle from which two, 30-foot, ¾-inch cables are suspended. These cables pass through the standard crosshead and fasten onto the sides of the sinking skip below the crosshead. On reaching the chairs at the lowest set of timber, the locking lugs holding the torpedoes are opened by the chairs, permitting the torpedoes and skip to pass to the shaft bottom. As the loaded skip leaves the bottom, the torpedoes pass the locking lugs and release the crosshead for movement up the shaft. The locking lugs fall into position, holding the crosshead and skip locked together for movement in the shaft. At the same time they have the safety feature of keeping the skip from dropping should the cables fail. To eliminate any delay in engaging the guides when the loaded skip is leaving the bottom, two short guides with rounded ends were first tried, but, because the alignment worked so well, these special guides were abandoned for the regulation guides. Operating distance of the safety sinking skip from the last set of timber to the shaft bottom is governed by its 30-foot cables.

Mucking 17 Skip Round

One and a half hours is the time required to muck out the 17 bucket round. This time includes lowering the mucker into position, mucking out the round, and hoisting the machine prior to the blast. Observation showed that from one and a half to two minutes was the average time to fill the 3½-ton skip, with a travel time of one minute for the skip at a depth of 500 feet. Slowest phase of the mucking cycle is the final bucket cleanup which takes from 10 to 15 minutes, while pumping water into the two skips is an additional delay in the mucking cycle.

Timbering—Eight-Foot Sets

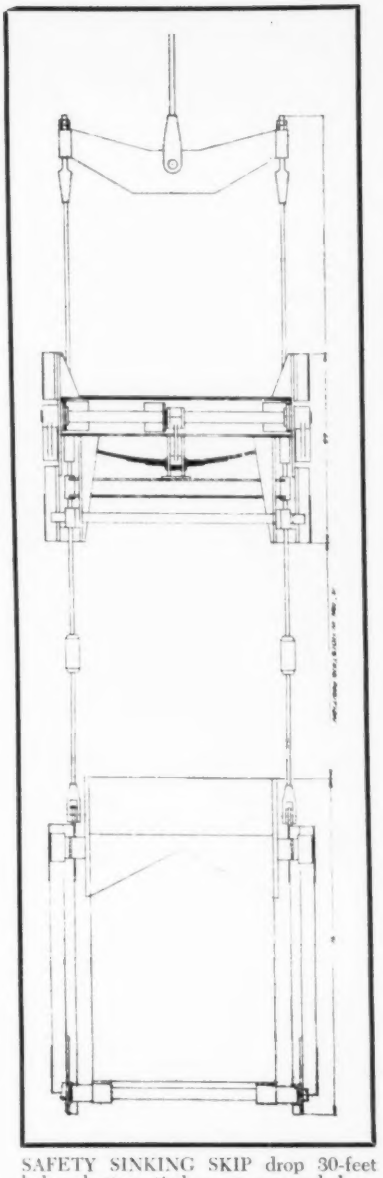
Eight- by eight-inch timber sets are carried on eight-foot centers with one center divider for the two five-foot inside compartments. The two wall plates are swung under the sinking skip with the remainder of the set placed inside the skip. The wall plates are hooked on the ⅝-inch hanging rods, then, with the sinking skip serving as a stageing, the two end plates are placed and the set blocked. Two hours is the maximum time for lowering and placing a set of timber. To insure greater strength for the hanging rods and to eliminate the possibility of a severe strain opening the hooks of the rods, a 5-inch length of 2-inch pipe is placed over the two hooks of the rods.

The 7-foot 3-inch long panel lagging is placed on all six sets with ladders and landings. In order to keep this dead work, even with the sinking cycle, two men from the bottom do this work during the mucking cycle, as only one man, the Cryderman operator, does all the mucking.

The Shattuck Denn Company, a wholly owned subsidiary of the Shattuck Denn Mining Corporation, is a long-time mining company with Plateau uranium mining experience on Club Mesa near Uravan, Colorado. The new mine is being developed on the Velvet claims leased from Kerr-McGee Oil Industries, Inc. and Anderson Development Corporation to replace the closed Club Mesa operation.

Congratulations to the company and its staff for developing and pioneering this new equipment. Don't be too surprised to see similar equipment in use in new shafts in Utah, Wyoming, and New Mexico.

THE END



SAFETY SINKING SKIP drop 30-feet below bottom timber set suspended on two ¾-inch cables. Crosshead remains on set.

Essen Mining

Mining machinery manufacturer from a dozen leading mining nations unveiled a wide variety of their latest equipment developments at the internationally famous German Mining Exhibition in Essen, held September 13 to 28. While essentially a German show, a large number of manufacturers from surrounding European countries, and also the United States, were well represented.

Starting after World War II from a small scale and with a limited number of manufacturers of underground mining machinery, the German Mining Exhibitions in Essen have now become well-known throughout the world for the quality and lavish scope of their exhibits. Today this is indisputably the largest mining show in the world. The 1958 exposition boasted more than 500 exhibits with an attendance over the two-week period which exceeded 400,000.

While predominantly a coal mining exposition this year, because 1958 marked the 100th anniversary of the "Steinkohlenbergbauverein" (Germany's trade and technical association for the coal mining industry), many of the exhibits featured newest developments in equipment for ore and metal mining as well.

A substantial number of leading United States manufacturers were represented, either through exhibits sponsored on their own account, or those undertaken by their European agents and representatives.

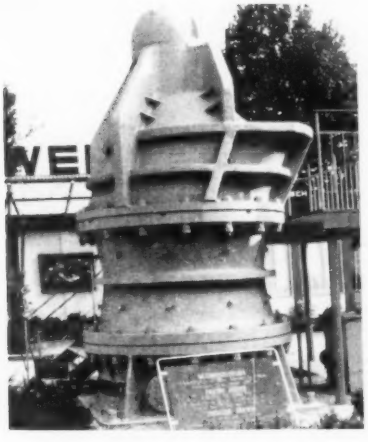
Some of the noteworthy equipment items of significance to ore and metal mining were as follows:

Longyear, one of the United States companies exhibiting at Essen, featured new Hi-Speed air leg diamond drill. This is a portable, one-man-operated tool that requires no spraging or bracing for drilling in line with or at small angles to the leg. It is powered by a 10-hp air motor and operates from an 80 pound air supply using approximately 220 cubic feet per minute at full load.

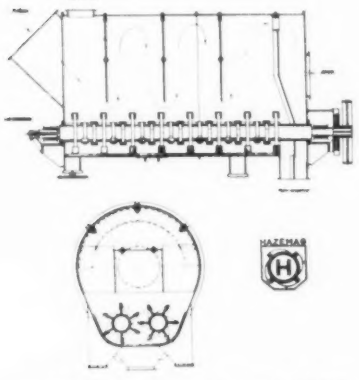
Ingersoll-Rand displayed a complete line of surface and underground drills and a portable compressor. The self-propelled Crawl IR was the featured piece of equipment.

MACHINERY SILHOUETTED against the Essen skyline carries names of world's leading equipment manufacturers: Krupp, P and H, Scharf, Eimco, Demag, AEG, and Siemag. The outdoor park was filled with full-size production-line machinery.

Fair Sets Record for New Equipment



Esch-Werke featured two pieces of new equipment. The first is a gyratory crusher designed to combine the advantages of conventional jaw and cone crushers. This is achieved by mounting on top of a conventional cone crusher a receiving ring which is enlarged at one side and equipped with a fixed jaw plate to carry out the initial reduction of the rock before it enters the lower cone mechanism. Its capacity is 180 tons-per-hour of rock at 55 inches by 35 inches which can be reduced to under 4 inches in size. It is powered by a 100-hp. electric motor driving through a fluid coupling. The second new product is a gyogranulator in which all rotating parts are ball-bearing mounted. This is a low headroom design incorporating a high-speed overload safety device. It will reduce 15 tons-per-hour up to 1½ inch in size down to less than $\frac{5}{16}$-inch pieces.

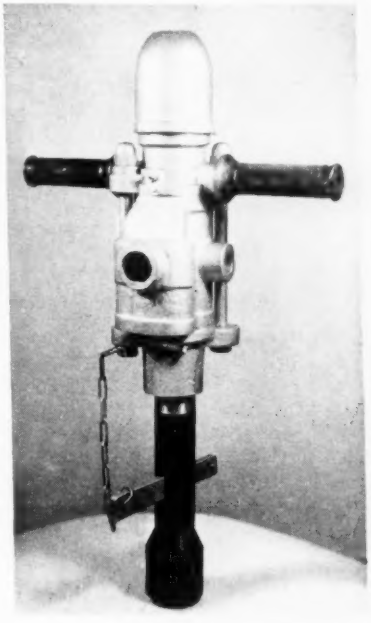


HAZEMAG Rapid Dryer (System ANDREAS)

Hazemag featured two new items of note. One of these, known as the "Retroflux Air Filter," is designed to provide filter element cleaning without interruption of the normal filtering process. The filter bags are continuously cleaned by jet tubes arranged in the filter frame. In the frame, which usually serves to clean several bags at one time, there are two horizontal systems of jet tubes arranged at right angles to each other so that progressive cleaning of the whole filter element is achieved efficiently and without damage to the fabric.

The second new Hazemag product is a Rapid Dryer which operates on the "Andreas" system. It is designed for the economical drying of bulk materials, including rock dust, sand, phosphate, and ore concentrates. The Rapid Dryer incorporates a hot air generator which can be coal, oil, or gas fired, and connected by pipe to the dryer. The other main units are the feeder, the dust collector, and the exhaust blower. It is suitable for use, together with any type of grinding or combined drying and grinding equipment.

Friemann & Wolf of Duisburg drew considerable interest with its new FW portable miners' signal lamp, the upper portion of which contains microtelephone equipment. Any desired number of these signal lamps may be operated as telephone exchanges at any spot needed, such as the working face, underground storage and workshops, main haulage ways etc. Telephone communications between the units is handled simply by plugging them into "intrinsically safe" cable lines and couplings. Operation of a push button on the telephone blinks the bulbs of the signal lamp and the person thus called can take part in the telephone conversation by simply plugging his telephone into an available connection point wherever he may be in the mine.



Heinrich Flottmann, GmbH, had on display a new water-cooled, two-stage, double-acting reciprocating-compressor. Its main features are the remarkably low power demand and its small size. The low-pressure cylinder is arranged vertically on top of the crank case and the high-pressure cylinder horizontally.

Also shown was a drill steel extractor with which it is claimed that stuck steel of any length can be extracted easily in a few seconds without being damaged or bent. This handy easy-to-operate tool is available for steel of any diameter.

Austin Hopkinson, the British company, featured its well-known range of Pikrose mine scraper hoists in the form of a 125-hp. electric unit with pneumatic clutch operation and spring loaded anchor shackles to reduce rope shock. A new piece of equipment on this stand which attracted attention was the "Pikrose" hydraulic haulage gear which incorporates Vickers-Armstrongs' hydraulic transmision. The drive mechanism on the new hoist consists of a constant-speed flame proof electric motor coupled to a variable-speed gear pump unit.

How to Crush and Hoist 4,000 Tons Per Hour

Kiruna—Sweden's Largest Iron Ore Mine—Uses Underground Crushing and Eight ASEA Hoists

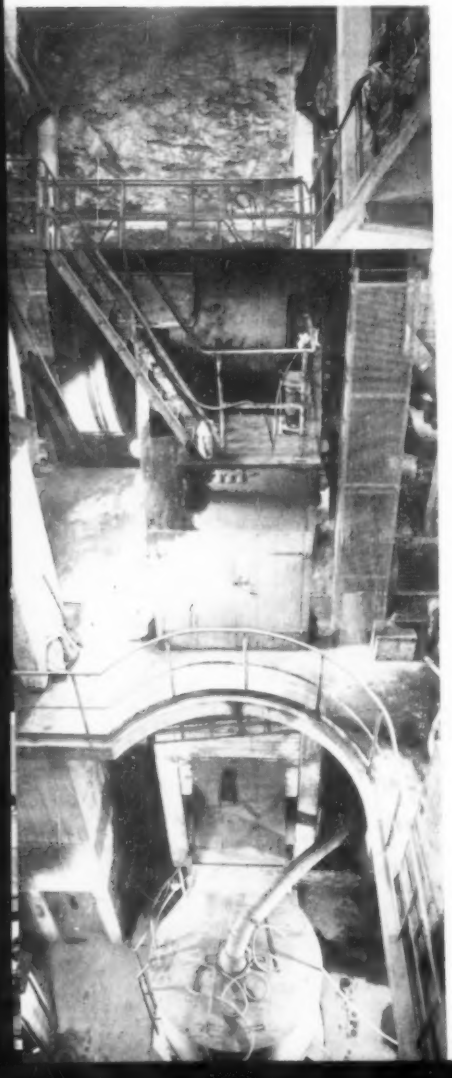
BY AXEL W. KJELGAARD

When a 16,000,000-annual-ton underground iron ore mine was planned at Kiruna, Sweden by Luossavaara-Kiirunavaara Aktiebolag, special research studies were made to determine how this ore would be hoisted.

These studies soon proved that the ore should be crushed underground before hoisting. The decision was made to centralize hoisting, to build the surface hoisting plant as an integral part of the Central Concentration Plant, and to use friction (Koepe) hoists.

With a planned hoisting cycle of 4,000 metric tons per hour, two shifts per day, five days per week, and simultaneous hoisting from several levels, it was immediately apparent that multiple hoists would be needed.

Nine identical in-line shafts have now been completed and completely covered by the hoisting section of the 365-foot-long Central Plant. Eight identical hoists are used for ore and a smaller (ninth) hoist for men and supplies. This is the world's largest hoisting plant in terms of tonnage and number of units. Multiple units have the advantage of efficient hoisting of underground ore as mine production is increased. See the September 1958 issue of MINING WORLD, pages 32 to 37, for a full report on "How Kiruna Mining Goes Underground Using Transverse Sub Level Caving."



UNDERGROUND CRUSHING STATION where cars dump at top into jaw crusher (center). Undersize is grizzlied with coarse ore feeding gyratory at bottom. Note inclosed hood for dust collection system.

Why Koepe Hoists

In the early 1940's, preliminary Kiruna staff discussions took place regarding future hoisting of ore when underground mining would become necessary.

It was decided then to use multi-rope friction (Koepe) hoists. The main reasons for selecting Koepe hoists for the new Central Plant were as follows:

1. By using four hoisting ropes, a smaller rope diameter and drive pulley diameter were possible, resulting in a smaller torque on the pulley end of the gear box.

2. The weight and size of the hoist were greatly reduced, making it possible to place it on the top floor of the headframe building, thus eliminating the necessity of building a separate hoist house.

3. The mechanical handling of the hoisting machinery could be carried out by smaller cranes and the installation greatly facilitated.

4. The diameter of the driving pulley could be equal to the center distance between the skip and the counter weight in the shaft. Therefore no deflection sheaves, which would have added to the height of the building, were needed.

5. The building height necessary for the overwinding distance could be used to house the Ward-Leonard sets, and the high and low tension switchgears.

6. By placing the hoists in the headframe, the ropes were protected against the hard northern winter. The use of several ropes on each hoist was an additional safety feature.

The hoisting of men and material from eight different levels of the shaft made single hoisting the only reasonable solution. The 15-ton-capacity skips, at full mine production, will operate from three different loading stations so it was necessary to adopt a skip balanced by a counter weight.

The possibility of adopting double hoisting with two skips in balance was investigated, but it was found that due to the comparatively shallow depth of the shaft, maximum of 1,500 feet, the rope weight and, consequently, the rope tension would be too small to prevent slipping of the rope on driving pulley during acceleration and emergency stops. Therefore it would have been necessary to load the skips with extra dead weights to maintain safe operation. This would necessitate a larger rope, a larger pulley diameter, and the use of deflection sheaves which would have increased the tower height.

The skips run on rubber wheels along rectangular pine guides in each shaft. There are plans to eliminate the guides, and, instead, to line the shafts with concrete and let the rubber wheels run on the concrete walls.

The man hoist and the eight ore hoists are placed on the top floor of the reinforced concrete headframe building. This building is 170 feet high, 36 feet wide, 365 feet long, and directly connected to the concentration plant.

The hoisting equipment was delivered by ASEA (Allmanna Svenska Elektriska AB) and included the electrical distribution system with outdoor transformer station, high and low tension switchgear, ore hoists, skips, measuring pockets, ventilating equipment, and overhead cranes and elevators in the tower building.

The technical data for the man hoist and the ore hoists are shown in the Table. When the shaft depth is

increased from 1,000 to 1,500 feet, the ore hoisting speed will be doubled to 2,200 feet per minute and the motor output will be increased to 1,700 kw by adding another motor to each hoist.

Electric Installations

All hoists are driven by a direct-current motor with Ward-Leonard generators driven by synchronous motors. The Leonard sets are placed on the floor below the hoist room; on next lower floor, the ventilating equipment; on the second floor below, the high and low tension distribution and the operating panels for the ore hoists; below this, a cable floor; and, lowermost in the building, the discharge stations, and the ore pockets.

To cool the hoist motors and the Leonard sets and keep the machine room under positive pressure, almost 300,000 cubic meters of air per hour will be required when the plant has reached full production. The fresh air enters through openings in the walls below the convertor floor, is cleaned in automatic oil bath air filters, passes the motor generators, and is then conducted to the hoist room. From there, the ventilating air is taken through air duets, along the walls, to the ventilator floor where, in winter, part of the heated air is mixed with the incoming cold air, while the major part is conducted to the concentration plant and then down the shafts.

Each hoist has two separate but combined service and safety brakes acting on two separate brake drums. The safety brake is spring operated. It is held in "off" position by a compressed air cylinder compressing the springs which apply the brake shoes to the drum when the air is let out of the cylinder. By using springs instead of the conventional falling weight, a room below the hoist can be dispensed with and the building height reduced. The service brake is also lifted by springs and applied by a compressed air cylinder. At emergency stop, both brakes are applied

Details of Ore and Man Hoists at Loussavaara-Kiirunavaara Aktiebolag

Item	*Man Hoist*	*Ore Hoists*
Capacity	—	500 tons per hour (metric)
Working load	8 tons, or 80 men	20 tons
Weight of skip	7.5 tons	16.5 tons
Depth of shaft	1,000 feet	1,000 feet
Hoisting speed	1,980 feet per minute	
Number of ropes	4	4
Rope diameter	32 millimeters	36 millimeters
Pulley diameter	8.0 feet	10 feet 7⅛ inch
Motor	300 kw	800 kw

WORLD'S LARGEST HOISTING plant at the top of the Kiruna mill building. These eight ASEA Koepe hoists are each designed to lift 500 tons per hour from a depth of 1,000 feet. The ninth, man and material hoist, is at far end.

in such a way that their brake forces are not added to each other.

The hoist motor turns the pulley through a precision gear box which is a totally enclosed unit supported by springs which eliminate the extra forces which may arise due to any settling of the foundations, alignment errors, or hoisting shaft deflection. These springs also reduce the stresses on the ropes and the mechanical parts of the hoist during starts and emergency stops.

Plastic Friction Inserts

For the friction inserts in the pulley rope grooves, different materials, such as leather, aluminum, and plastic, were considered. It was decided to install leather to begin with, and to base calculations on a friction coefficient of 0.2 and a specific groove pressure of 20 kilograms per square centimeter. Experience has shown that plastic is more resistant to wear and has a higher coefficient of friction than leather so that all inserts will gradually be replaced by plastic materials.

Hoists Fully Automatic

From the beginning it was planned that the ore hoists would operate fully automatically. At that time, insufficient experience with automatic a-c-driven hoists of similar sizes had been obtained, so d-c drive with the Ward-Leonard system was adopted. Speed regulation was obtained by metadyne amplifiers with closed loop control. The principle of regulation is as follows:

The hoisting speed is represented by the voltage from a tachometer generator driven from the hoist while the desired speed corresponds to the voltage of a potentiometer whose potential is changed according to the position of the skip in the shaft. The differential voltage is fed into the excitation winding of the metadyne generator whose armature is connected to the field winding of the Leonard generator.

Impulses for acceleration and retardation are given from a floor selector driven from the hoist and containing a number of magnetic contacts which copy the position of the skip in the shaft. This apparatus contains transmitters for the electrically driven depth indicators. To compensate for rope creep or possible rope slip, the floor selector is provided with an automatic synchronizing device adjusting it to the correct position every time the skip arrives at the discharge station. For the man hoist, this synchronization is effected whenever the cage stops at the most frequented level.

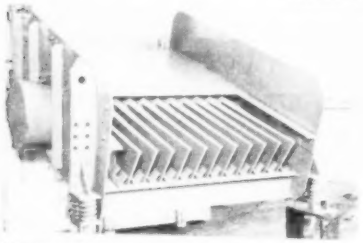
The man hoist is normally operated by means of pushbuttons from a cage and eight different levels, but it can also be used for hoisting rock in cars. For this service, the cage is provided with hydraulically operated chairs which automatically engage corresponding openings in the shaft wall when the cage arrives at the loading or unloading station. These chairs hold the cage in a fixed position during the loading operation.

Two-Stage Crushing

Underground crushing is used because it makes skip loading and hoisting faster, cheaper, and easier. In addition, it simplifies construction and operation of the concentrator.

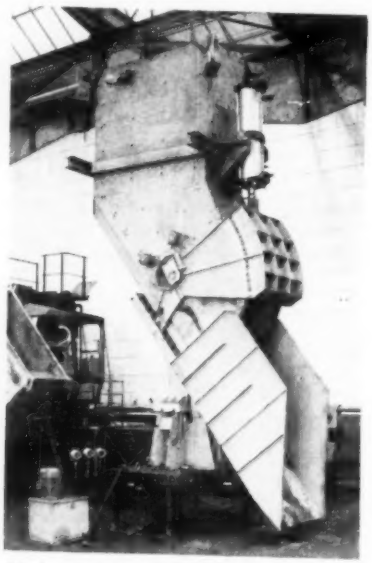
It was known that when the high-grade Kiruna ore was crushed to minus-4-inches, ore and gangue were separated sufficiently for effective concentration. The best market is for lump ore, so production of fines must

BELT FEEDERS have proved superior for drawing crushed ore from underground bin to skip loading pocket. Entire unit can be replaced in few minutes if belt rips or feeder breaks down.



VIBRATING GRIZZLY with tapered rails feeds coarse ore to gyratory crusher.

CONDUCTOR is electronic brain which controls skip loading and hoisting.



SKIP MEASURING POCKET with hydraulically operated door in open position.

ore minimized. Maximum size of run-of-mine ore would be 40 inches. This meant that reduction ratio would be 10-to-1. It was determined that the most efficient crushing would be done in two stages: first, in a single-toggle, 55- by 71-inch jaw crusher, set at 16 inches, designed and built by Morgardshammars Mekaniska Verkstad; and second stage in a 24-inch Morgardshammars gyratory crusher.

Both crushers have several unique design and construction features. While many jaw crushers have reinforcing ribs on the outside of the sides of the main frame, those at Kiruna do not. Actually the sides are made from low-cost, rolled-steel plate, with the ends connected by heavy steel plugs carefully machined and inserted in the sides with a close fit. The reason is that calculations prove that ribs on the side actually weaken instead of strengthen the frame; that is, assuming the main frame as a whole and that the corners represent a fixed connection and not a "charnier."

The swinging jaw is fitted with heavy anti-friction bearings with automatic grease lubrication and automatic temperature control. With these features and the low reduction ratio, the crusher requires only a 110-kw motor with a speed of 740 revolutions per minute; flywheel speed is 150.

The gyratory crusher has an intake of 24 inches, a flared cone frame with a diameter of 73 inches to insure high capacity, and is driven by a 150-kw motor through a texrope drive and pinion drive on the main shaft. The close side setting is normally 3½ inches. The eccentric sleeve and lower end of the main shaft are mounted in heavy anti-friction bearings while the upper end of the shaft is mounted in a sleeve bearing shaped like a half-sphere. The lower bearing on the shaft is mounted in the sleeve with a loose fit so that it can move vertically in it.

The sleeve for the sphere is mounted in a house which, in turn, is adjustable vertically by means of a nut on the shaft-top and is pressed against this by means of hydraulic pressure. In this way an effective hydraulic release is created. To design such a release was considered necessary because of the high amount of coarse tramp steel scrap from the mine. After some difficulties with the sealing off of the hydraulic chamber were overcome, the release has operated satisfactorily.

A low-pressure system takes care of the roller-bearing lubrication. A control glass is mounted in the return pipes for each bearing. An electric relay shuts off the entire crusher system if the oil flow should fail.

Cars Dump Into Crusher

Transportation of ore to the crushing plants and dumping of cars was described by Mr. Berglund's article in the September 1958 issue of MINING WORLD, pages 52 to 57. To review, 20-ton, side-dump, Granby and 20-ton, bottom-dump, Malmberg cars are used. The latter cars empty much cleaner when handling wet and muddy ores; particularly, in the winter when ore freezes in cars. The use of larger, 30- to 50-ton cars is being considered for the next mining level to cut down the number of haulage trains.

Cars are dumped directly into the jaw crusher. A small concrete bin is located under the crusher to even out the flow to the gyratory. Ore from this bin flows over a vibrating scalper with undersize dropping directly to bin. Oversize goes through the gyratory and drops to same bin. First underground crushing plants delivered ore to as many as five bins by conveyor belt. The new gravity feed to bins has proved much cheaper. These bins are actually large raises driven in the solid footwall rock and hold about 1,000 tons each. A pneumatically operated gate under each gyratory directs ore into either bin.

Phosphorus content of the ore body varies widely. It is impossible to mine

the ore selectively, so a method had to be evolved to bulk mine, yet segregate train loads of crushed ore by grades. It was impossible to clean crushers and chutes between each trainload.

The "Plan of 1951" solved this by installation of identical yet multiple crushing plants on each level. Ore from each crushing plant can then be segregated by grade into two 1,000-ton ore bins ahead of hoisting. Thus, there are two crushing plants and four bins on the 275-meter level; four crushers and eight bins on 320-meter level; and probably five and 10 on the 420 level. So today each unit crushes ore of nearly same grade only.

The fourth crusher station at the Central Plant which went into operation recently had a single-toggle Wedag (German) jaw crusher with a special hydraulic release instead of the conventional toggle.

Crusher performance has been satisfactory, and maintenance cost acceptable. The capacity of each crusher station was calculated on the basis of 1,000 tons per hour. The highest rate to date is 19,000 tons in two shifts, corresponding to 1,350 tons per effective working hour.

In the primary crushers, the life of crusher plates is much shorter for the lower than for the upper plates. After 800,000 to 1,500,000 tons, the lower plates have to be replaced. They are then used as replacement for the upper plates, or as liners in the chute ahead of the crusher. The life of the upper plates is about three times that of the lower.

Mr. Kjegaard, former Chief Mechanical Engineer for Luossavaara-Kiirunavaara Aktiebolag, is now a consulting engineer with offices at Becksjudarvagen 35, Nacka (Stockholm), Sweden. He expresses his gratitude to the company's management for permission to publish his series of articles. He is indebted to his colleagues on the Kiruna staff for their collaboration on the extensive development work. Special thanks are given to the neighboring mine, Tuolluvaara Gruv Aktiebolag, for important research on rubber chutes in concentrating plants.

Total maintenance labor was 0.7 manhour per 1,000 tons. Material cost amounted to 0.18¢ per ton during 1957.

Because it is probably the first time that such heavy roller bearings have been mounted in gyratory crushers, they have been checked closely. An inspection of the first crusher installed showed that after 3,500,000 tons crushed, no maintenance was needed on the bearings. The second crusher, which had mainly crushed very hard contact zone ore at 1,200,000 tons, showed that the bearing on the main crusher shaft had rotated and that the shaft had to be repaired at a cost or 0.012¢ per ton. The total labor on the first gyratory was 0.9 manhour per 1,000 tons; material cost was 0.09¢ per ton.

Life of crusher parts is very dependent on material crushed. When crushing contact ore, life is only about 1,000,000 tons, but when crushing ore, it is about 3,500,000 tons. At Kiruna welding is cheaper for rebuilding the worn section of the cone, which normally is mainly on the lower part. A stainless electrode to bond a 13 percent manganese electrode to the cone has been used. An imported electrode "Diamond" has been used on one cone. The result as to wear resistance has yet to be learned.

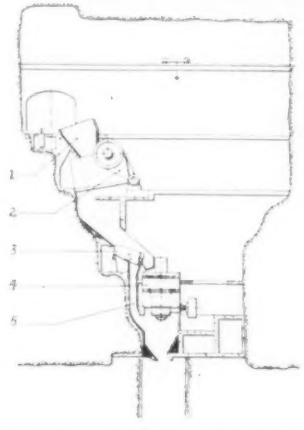
From the bins, the ore is hoisted by means of a fully automatic system, comprising a feeder, a measuring hopper, a skip, and the mine hoist itself.

Three Feeders Tried

Three different feeders have been tested, namely, an apron feeder, a special feeder built from the same parts which are used in the Joy shuttle car conveying system, and finally a belt feeder. Experience has shown clearly that the belt feeder is

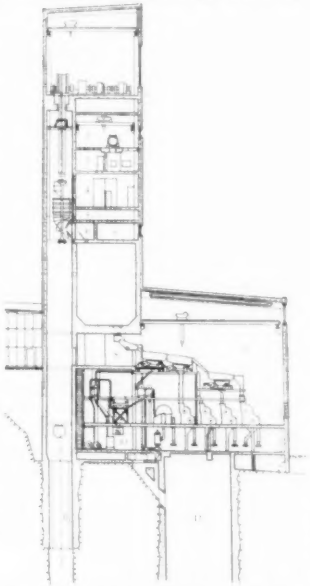
Continued on page 85

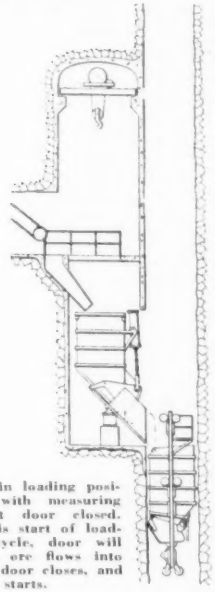
How Kiruna Builds Crusher Station, Hoisting Plant, Skip Pocket



1. Cars are dumped directly into crusher feed bin.
2. Morgardshammers 55 by 71 inch jaw crusher.
3. Vibrating grizzly feeds coarse ore to gyratory.
4. Special 24-inch gyratory crushes to minus-4-inch.
5. Grizzly undersize bypass chute to underground bin.

1. Hoist room at top of building.
2. Ward-Leonard generator sets.
3. Ventilation equipment placed here.
4. Electrical distribution system.
5. Cable storage floor.
6. Skip dumping scrolls and access way.
7. Mill bins for crushed ore.
8. Bin draw off feeder floor.
9. Magnetic concentration mill.
10. Dust collection and electrical panels.
11. Hoisting shaft.
12. Concentrate storage bin excavated from solid rock. Bottom discharge to railroad cars in tunnel from surface.





Skip in loading position with measuring pocket door closed. This is start of loading cycle, door will open, ore flows into skip, door closes, and hoist starts.

PRODUCTION EQUIPMENT PREVIEW

PEP is just what new equipment, increased mechanization, and new methods can give to your mine, mill or smelter. This PEP section is MINING WORLD's way of making available to you some of the finest current information on mechanization.

New Exhaust Conditioner For Diesel Equipment

A new exhaust conditioner has been developed for underground Diesel-powered equipment. The unit is said to cool exhaust gases from as high as 1,300° F. to a maximum of 160° F. and remove the solid particles of combustion which normally appear as smoke. The conditioner operates on a venturi-pressure principle. It is a water batch unit, and the manufacturer claims that performance is such that water losses are practically limited to those of evaporation. Write National Mine Service, Koppers Building, Pittsburgh 19, Pa. for additional data.

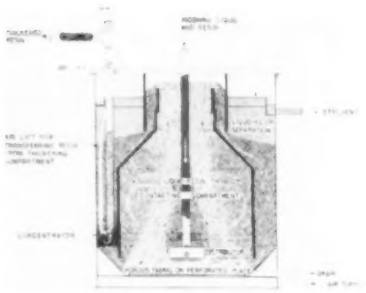
New Air Cleaner Will Cut Repair and Servicing Time

A new dry type air cleaner has been announced by Caterpillar Tractor Company, which claims the unit offers unparalleled efficiency and simplicity for cleansing engine intake air. The air cleaner was developed for use on Cat DW20 and DW21 tractors, and spokesmen say that it removes 99.8 percent of all dirt from the Diesel's intake air. A disposable, resin impregnated cellulose filter, multi-cyclone precleaner, aluminum center tube, housing and collector tray make up the unit. Air is drawn through the stack cap, passes down through the aluminum center tube and enters the multi-cyclone precleaner, where 95 percent of the dust is removed. The air then travels up through the cellulose filter element and then directed to the intake manifold. Advantages claimed: reduced servicing costs and time; cost of replacement filters is considerably less than cumulative cost of oil and man-hours for servicing oil bath types. Write the company at Peoria, Illinois for additional information.

New Wire Rope Combines Lang Lay and Regular Lay

A new type of wire rope combining the flexibility and abrasion resistance of Lang lay rope with the stability of regular lay rope under severe operating conditions has been announced by the Wire Rope Division of John A. Roebling's Sons Corp., Trenton 2, N.J. Herringbone wire rope is a new construction employing two pairs of Lang lay strands and two strands of regular lay. This new wire rope has relatively large outside wire construction to take the pressure and abrasion of contact with sheaves and drums, combined with smaller inside wire construction so patterned as to provide the maximum flexibility in service.

According to the company, test results indicate superior flexibility, good resistance to shock and abrasion, smooth operation around drums and sheaves, easy spooling properties and excellent structural stability. These properties indicate Herringbone wire rope can serve a dual purpose, eliminating the need for stocking Lang lay rope for one type of service, and regular lay rope for others. For additional information, write the company at address given above.



Infilco CST Exchangers Offer Many Advantages

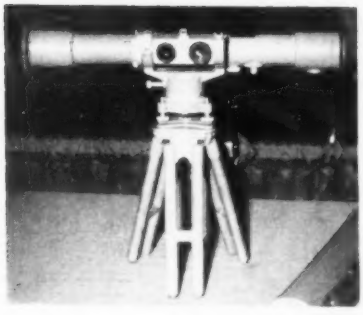
The Infilco continuous countercurrent resin-slurry ion exchange plant provides a means of carrying out ion exchange reactions in turbid liquors and slurries, with resin movement countercurrent to liquor flow. The Infilco CST Exchangers used in this system offer the following advantages:

1. Turbid liquor or slurries containing up to 6% by weight suspended solids can be handled by ion exchange methods.
2. Countercurrent resin advance through both loading and elution stages.
3. Continuous gravity flow of liquor and eluate.
4. Uniform high quality eluate.
5. Minimum plant size.

Learn of the many other advantages this system has to offer. Write to: Infilco, Inc., Tucson, Arizona.

Rotary Dryer Shipped To Canadian Potash Mine

This 7-foot diameter, by 60-foot long, parallel-flow rotary dryer, designed and built by Standard Steel Corporation of Los Angeles, was one of two dryers recently shipped to Potash Company of America Ltd.'s new mine at Saskatoon, Saskatchewan. Equipped with sawtooth lifters inside the shells, and full floating tires these dryers will process ore PCA's new $20,000,000 mine expected to begin operations late this year. For data on dryers contact Standard Steel Corporation, Box 58252, Los Angeles 58, California.



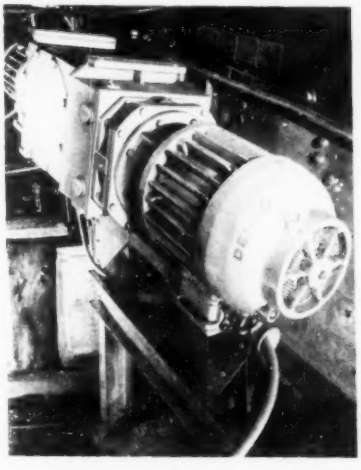
Coincidence Rangefinder For Topographical Work

The Wild rangefinder, with measuring head, is used for topographical mapping and general geological reconnaissance work. If used in conjunction with a plane table it eliminates the need for a rodman. The rangefinder operates on a split-image principle, and the manufacturer claims the following accuracy limits: at 100 feet, 0.2 feet; 200 feet, 0.4 feet; 300 feet, 1 foot; at 500 feet, 2 feet; at 1,000 feet, 8 feet; at 2,000 feet, 32 feet. The measuring head on the tripod makes it possible to read vertical and horizontal angles. Write to Wild Heerbrugg Instruments, Inc., Main & Covert St., Port Washington, N. Y. for additional information.

Two New Torque-Flow Pumps by WEMCO

Two new WEMCO Torque-Flow Pumps, available for the first time in a vertical as well as a horizontal model, have been announced. In addition to being available in vertical models, the new pumps—designated as Type D and DL—are also available with a variety of drives. These drive options include: belt, close coupled, pedestal mounted, and extended shaft.

The type D is available in both four-inch and six-inch sizes, suitable for general duty pumping of solids even at high heads and capacities. The model DL is a smaller version of the same pump, available only in the four-inch size, usually used on low head applications. Both new pumps have retained the design characteristics of earlier Torque-Flow Pumps. This radical design, featuring a recessed impeller, makes the pump non-clogging and highly resistant to abrasion. For additional information write to: WEMCO Torque-Flow Pump Division, Western Machinery Company, 650 Fifth St., San Francisco 7, California.



Conveyor Drive Assembly Featured by Demag at Fair

A compact easy-to-handle electric mine conveyor driving assembly was one item featured by Demag on a 16,000 square-foot exhibit stand at the recent German Mining Exhibition held at Essen in September. The unit is powered by two motors of different capacity and driven through planetary gearing. Four forward speeds and one reverse speed are obtainable without the necessity for shifting gears. The main advantages claimed for the design are low wear of moving parts, achieved by varying the conveyor speed to suit the required conveying capacity; constant torque at all speeds and elimination of fluid couplings. For details contact Demag AG at Wolfgang-Reuter-Platz, Duisburg, Germany.

Clark Equipment Introduces 13-Ton, Rear Dump Wagon

Clark Equipment Company has introduced a 13-ton tractor wagon, known as the Michigan Model 110. The wagon is designed to haul rock and similar material that can't be self-loaded by scraper. Low loading height (7½ feet) is one advantage claimed since the wagon can be fed by virtually any power shovel, conveyor or medium-duty tractor. The unit is a rear-dump; its capacity is 12 yards heaped and 8.3 yards struck. The manufacturer says that the rear dumps' hydraulic system is completely shrouded to guard against damage from bouncing rock. Data can be obtained from Construction Machinery Division, Clark Equipment Company, Pipestone Road, Benton Harbor, Michigan.

ELECTRIC EAR for regulating feed rate to grinding mills has been improved, and Hardinge Company describes the modifications in a new brochure. Unit has been adapted to include a sound-level recorder which keeps a 24-hour record of grinding mill operations. Hardinge says proper application can increase tonnage 10 to 20 percent. Write the company at 20 Arch St., York, Pennsylvania for a copy of Bulletin AH-480.

DIAMOND PRODUCTS: Christensen Diamond Products have available for you a new catalog describing the complete line of Christensen core barrels, diamond bits and related equipment. Send for your copy. Write to company at 1937 South 2nd. West, Salt Lake City, Utah.

COMPLETE FACTS are available for you on Radicon Complete Drive motor and gear reducer assemblies. Entire assembly is ready to install in a very short time. Write today for additional information. Address your inquiry to David Brown, Inc., 999 Beecher St., San Leandro, Calif.

BLASTERS' HANDBOOK: The new Du Pont Blasters' Handbook is now off the press and is ready to be sent to you. Here's your complete up-to-date manual on Blasting. Send $1.75 to E. I. Du Pont De Nemours & Co., Inc., Explosives Dept., 2543-G Nemours Bldg., Wilmington 98, Delaware, for your copy.

CYCLONE TECHNIQUES by Equipment Engineers Inc., are described in a new bulletin No. 830. Learn about the lower classifications costs, low capital costs involved with the use of Krebs Cyclones. Send for your bulletin. Write the company at 41 Sutter St., San Francisco 4, California.

BLASTING COST CHART: With the new Atlas Powder Corporation Blasting Cost Chart, you will have available a simplified computing method to obtain your true blasting cost picture. Write to the company at Wilmington 99, Delaware for your copy.

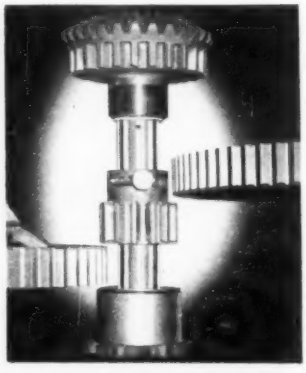
GOOD INFORMATION on Roof bolts, High Strength Steel, Cap Screws and Truscon "Pidget Buildings" is available from Republic Steel Corporation, 3238 East 45th St., Cleveland 27, Ohio. If you are interested in any or all of the above products, write to the company and they'll give you the whole story.

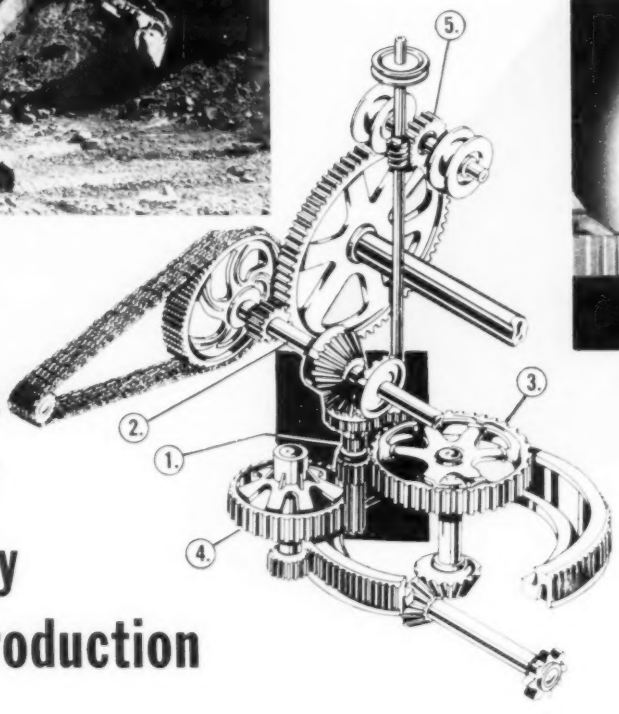
MULTI-PURPOSE Metal Buildings are described in new literature published by the Columbian Steel Tank Co., P.O. Box 1048-H, Kansas City, Missouri. The buildings are fabricated from steel of sectional or rigid frame construction. Write today for literature.

PULSATING MAGNET: Syntron Company, Homer City, Pennsylvania, have recently published a catalog on their new "Pulsating Magnet" Electric Vibrator. The 12-page booklet contains complete data and specifications for Syntron's 14 standard vibrators. Write to company for your copy.

WET CLASSIFICATION literature is now available from Harding Company, Inc., York, Pennsylvania. The newly revised catalog covers Classifiers, Hydro-separators, Washers and Heavy Media Separators. Grinding and wet classifying flow sheets are also included in Bulletin No. 39-C. Write to company.

A fast cycle and a full dipper every pass enable this 2½-yd. Model 3500 shovel to move overburden at top speed for 'round the clock operation. One of the most important factors contributing to a consistently high production rate is the Manitowoc "Power-flo" drive described below.





The key to Manitowoc's extra power is the key to top production

. . . and that extra power is provided through the *exclusive* Manitowoc "Power-flo" slide pinion arrangement that directs the full flow of engine power *only* to the function in operation. There are no power-robbing extra gears moving, even when not in operation (and gears that don't move don t wear out) . . . no complicated trains of gears that hold production down and keep maintenance costs up.

What arrangement could be simpler? As shown in the photograph above, the slide pinion itself is a single, sturdy shaft, spline-fitted with the necessary gears to engage, or disengage the desired function. The slide pinion (No. 1 on the drawing) is driven directly from the drive shaft (2) using only one set of clutches to drive the travel, swing and boom hoist.

With the slide pinion up, the power flows directly from the reversing clutches to the travel gear (3) through the center pin and to the horizontal shaft in the carbody.

With the slide pinion down, the power flows directly to the swing shaft (4) containing the final drive pinion, which meshes with the carbody ring gear.

With the slide pinion in neutral, the reversing clutch is left free to operate the boom hoist (5) if an optional independent boom hoist is not used.

The result is *direct* power to every function . . . a feature found in *Manitowoc* cranes, draglines and shovels. The faster cycle, heavier lifts and bigger bites found in Manitowocs are the direct result of this simple and effective "Power-flo" design. That's why output is *measurably* higher with Manitowoc . . . that's why it will pay you to see your Manitowoc dealer for complete information on the rig best suited to your operation.

Manitowoc

MANITOWOC ENGINEERING CORP.
(A subsidiary of The Manitowoc Company, Inc.)
MANITOWOC, WISCONSIN

CRANES	SHOVELS	DRAGLINES	TRENCH HOES
20 TON - 100 TON	1-YD. - 5½-YD.	1-YD. - 6-YD.	1-YD. - 2½-YD.

United States

Personalities in the News———

Dr. William H. Schuette has been elected vice president of Dow Chemical Company, Midland, Michigan.

Kenneth Powell of Goldpoint, Nevada, was recently named office manager of the United States Milling and Minerals Corporation at Silver Peak.

Dickerson R. Watkins, formerly associated with San Francisco Mines of Mexico at San Francisco del Oro, was recently named to the position of mine project engineer at the potash division, Internation Minerals & Chemical Corporation at Carlsbad, New Mexico.

Sam E. Sharp, safety director of Tennessee Copper Company, Copperhill, Tennessee, was recently elected general chairman of the mining section of the National Safety Council.

Recent staff changes at International Minerals & Chemical Corporation's Bonnie chemical plant at Bartow, Florida, include the promotions of **C. Lester Richards** to assistant production manager, **A. A. Guffey** to production superintendent, and **Ralph W. Lorentz** to service superintendent.

John Parden, industrial engineer, was recently named assistant maintenance superintendent of United States Steel's Oliver Iron Mining Division, Eastern district. Other recent Oliver appointments are **Bill Rush**, Eastern district operating engineer, and **Bob Graham**, industrial engineer.

Lawrence J. Ingvalson, assistant general superintendent of the Great Falls, Montana, reduction works of The Anaconda Company since 1956, has been advanced to the post of general superintendent. **Leonard C. Powell** has been named assistant general superintendent. **James I. Owings** succeeds Mr. Powell as development engineer.

John J. Sheppard, district manager of Western-Knapp Engineering at Hibbing, Minnesota, has resigned. **Bengt A. Samuelson**, project manager of Western-Knapp construction for the Hayden smelter of Kennecott Copper Corporation, has replaced Mr. Sheppard as district manager.

Richard H. Lewin, of St. Louis, Missouri, has been named president of the Lewin-Mathes Company, division of Cerro de Pasco Corporation.

C. Mittendorf recently resigned as administrator of the Office of Minerals Exploration to accept a position with the International Cooperation Administration as director of their industry and transportation mission to Iran.

ROBERT G. DOYLE was recently appointed to the position of Geologist with the Maine Geological Survey. Prior to his appointment, Mr. Doyle was associated with the St. Joseph Lead Company in Missouri as mine geologist. A graduate of Harvard, he has also spent several years in Peru as a field geologist.

JOHN B. KNAEBEL, MINING WORLD'S 1956 "Mining Man of the Year," will again be honored as a member of the mining profession. Mr. Knaebel, a 1929 graduate of Stanford University and now consultant to Anaconda Company in Grants, New Mexico, will be presented with the William Lawrence Saunders Gold Medal of the American Institute of Mining, Metallurgical, and Petroleum Engineers at the AIME's annual meeting in San Francisco in February. Mr. Knaebel has worked in the mining industry in the Philippine Islands, British Guiana and Brazil in South America, and the Central Americas, as well as in the United States. The award will honor Mr. Knaebel "for his versatility and courageous leadership in pioneering, exploring, developing, and managing highly successful mining ventures as a leader among men."

D. I. Hayes has been elected vice president and general manager of New Hidden Splendor Mining Company. **W. Rodney DeVilliers** was elected a senior vice president of the New Hidden Splendor Company.

E. F. Machell has been named chief product engineer, American Gilsonite Company, Salt Lake City, Utah.

Philip T. Peterson, former manager of J. R. Simplot Companys' Gay phosphate mine at Fort Hall, Idaho, is now manager of the company's new clay mining operations at Boville, Idaho. **John Clouser**, former mine superintendent at the Gay mine, has been promoted to general superintendent. Other personnel changes include: **Dave Aro**, former resident engineer at the Gay mine, now superintendent of the Centennial mine near Monida, Montana.; **Robert Hill**, formerly associated with the Anaconda Company, now employed as resident engineer at the Gay mine; and **Norman Lehman**, recent graduate of Stanford University, now employed as geologist for the Gay phosphate mine.

William H. Bartlett has been named to succeed **F. O. Davis** as treasurer of the Potash Company of America, Carlsbad, New Mexico. Mr. Bartlett joined PCA's staff in 1943 as chief account, and has been controller for the company since 1950. Mr. Davis is now president of the company.

John S. Wright, mine superintendent with United States Potash Company's operations at Carlsbad, New Mexico, has assumed responsibilities as field superintendent in charge of both the mine and refinery, following the resignation of former refinery superintendent, **George R. Bowland**. Other promotions include: **John C. Horne** promoted from assistant mine superintendent to mine superintendent; **Francis L. Pierson**, former chief geologist, now assistant mine superintendent; **L. A. Tillotson** advanced from chief chemist to refinery superintendent; **Woodrow W. Lair** promoted to assistant refinery superintendent from refinery production forman; and **George A. Heaton** placed in charge of the geology department in addition to his duties as chief mining engineer.

Charles A. Lindberg, assistant superintendent of maintenance for the Oliver Iron Mining Division, U. S. Steel Corporation, Virginia, Minnesota, has retired.

O. T. Hanson of Boise, Idaho, has been appointed Idaho state mine inspector, succeeding George McDowell who recently resigned. Mr. Hanson has been minerals examiner for the state land department for eight years. He is a graduate of Utah State University and has done graduate work in geology at the University of Missouri.

B. A. Risley was elected treasurer of the Beaverhead Mining Association Montana at a special meeting held recently. The association reports that it will begin a membership drive for the purpose of promoting the county's mining industry and to lend support to beneficial mining legislation.

Russell H. Crouse has been appointed production superintendent of Monsanto Chemical Company's Inorganic Chemical Division plant at Soda Springs, Idaho. Mr. Crouse, who was formerly mines and burden supervisor, replaces **W. P. Dunlap, Jr.** who is now production superintendent at Mobay Chemical Company's plant at New Martinsville, West Virginia. Mobay is a wholly owned subsidiary of Monsanto and Farbenfabriken Bayer, A. G.

S. K. Droubay was recently elected vice president of United Park City Mines Company, Salt Lake City, Utah. Mr. Droubay will continue to serve as general manager and member of the board of directors of the **Robert G. Dwyer**, Intermountain area counsel for the Anaconda Company, was also elected to the board of directors.

Fred A. Brinker is now assistant vice president of Vanadium Corporation of America, with headquarters at Durango, Colorado. Mr. Brinker was formerly chief metallurgist of the company's western division.

ROBERT B. HOY is now assistant to the chairman of the Earth Sciences Department of the Stanford Research Institute, Menlo Park, California. Mr. Hoy was formerly chief geologist for the New Jersey Zinc Company, serving in the northeastern states, with headquarters at Center Valley, Pennsylvania.

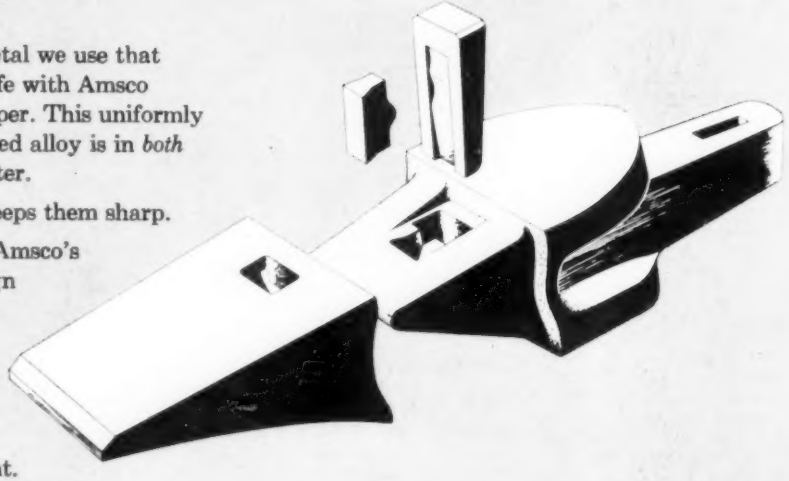
These users say AMSCO 2-part teeth outwear best competition 2 to 1

IT'S THE SPECIAL rugged metal we use that gives you double digging life with Amsco Simplex teeth on your dipper. This uniformly hard, yet tough, heat-treated alloy is in *both* the tip and its husky adapter.

Reversing tips is easy... keeps them sharp.

Positive Locking Device. Amsco's unique pin-locking design secures tip to adapter in tight, positive, metal-to-metal contact.

Try this 2-part Amsco Simplex next time you're down for tooth replacement. See your local power shovel dealer.



Massachusetts construction company* finds Simplex teeth outlast competitive 2-part teeth more than 2 to 1

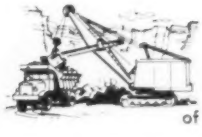
Two Simplex teeth were applied to a Lorain machine, at the outside corners of the dipper.

Two competitive 2-part teeth were installed between the Simplex teeth.

After a period of digging, the position of the two types of teeth was reversed, placing the Simplex teeth in the middle.

The Simplex teeth, observed after the test, *showed less than half the wear of the competitive teeth.*

*names and cases furnished upon request



North Carolina quarry* doubles tonnage per set of tips with Simplex

Several sets of competitive 2-part teeth averaged six to seven thousand tons per set of tips in rough going at this limestone quarry. Two sets of Amsco Simplex teeth were also tested in the same pit, on the same Northwest shovel. The first set of Simplex tips dug 12,445 tons, *without being reversed.* The second dug 13,920 tons, *without reversing* . . . twice the digging, twice the tonnage of all competitive teeth tested. In addition, this quarry owner stated, Simplex teeth had a more perfect fit between adapter and dipper lip and take less time to change.

Simplex teeth still digging — competitive teeth completely worn out in test on rugged road job

An Iowa contractor applied two Amsco Simplex teeth and two competitive 2-part teeth at the same time to the same Northwest Model 80-D shovel.

264 hours later, after nearly 6½ weeks of digging, the two competitive teeth were so completely worn out that they required replacement. At this time, the two Simplex teeth were little more than half worn. They showed only 1⅛" of wear on the tips.

150 hours of the 264 in the test involved extremely rugged digging, with some boulders encountered.

AMERICAN Brake Shoe COMPANY

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OTHER PLANTS IN: DENVER, LOS ANGELES, NEW CASTLE, DEL., OAKLAND, CAL., ST. LOUIS, JOLIETTE, QUEBEC

Newsmakers in International Mining

BYRON E. GRANT, former assistant general manager, has recently been named general manager of the Braden Copper Company, Chilean subsidiary of the Kennecott Copper Corporation. Mr. Grant is a graduate of the University of Utah and has completed graduate work at the University of California and University of Idaho. Before joining Braden Copper Company in 1955, Grant was associated with U.S. Smelting Refining & Mining Company.

Hambali Gandasaputra, a recent graduate of the Technical Faculty of the University of Indonesia at Bandung, has been named head of the mineral dressing research laboratory of the governmental geological survey at Bandung.

Carlos Escalante Zeron of Mexico, D. F., Mexico, has been a recent visitor to the Iron Range of Minnesota. Mr. Zeron is a mining engineer for the Mexican Government and is touring the area through the International Cooperation Administration program for the study of mining methods.

Masngud Dasuki, who received his engineering degree from the University of Indonesia at Bandung, is associated with the sulphur mining company, N.V. Perusahaan Belirang Telaga Bodas. This firm is engaged in increasing and perfecting its new production of crude sulfur and sulfur-containing powders—fungicides. **D. P. Loemban Tobing** is superintendent of the firm which was established in early 1957. The volcanic deposit being mined, named Telaga Bodas, lies north of the city of Garut, West-Java.

Several members of Behre Dolbear & Company are currently abroad. **Vinton H. Clarke** is in Kerman, Iran (See map in October **Mining World**, page 43) with **Dr. A. F. Blanfield**, organizing a mineral reconnaissance of 47,000 square miles. **Samuel H. Dolbear** and **Parke A. Hodges** are on a professional mission which has taken them to England, France, Germany, Denmark, and Sweden.

Joseph Jungwirth, mining engineer, recently moved from Rangoon, Burma to Bruck Mur, Austria.

Stan Giles, recently appointed general manager of Nchanga Mine in Northern Rhodesia, will leave at the end of the year to assume the position of consulting engineer (diamond section) at the Johannesburg office of Anglo American. He will be succeeded by **Mark W. Rushton**, who is assistant consulting engineer in the copper section at the Salisbury offices of Anglo American.

Aurelio Bergamaschi, formerly of Pisa, Italy, is now at Via Monte Santo, 8, Viterbo, Italy. Mr. Bergamaschi, a former student at Chemical Engineering Faculty at Pisa, Italy, is now working with the development of cinnabar flotation.

George R. Leland recently moved from Medellin, Colombia to Albuquerque, New Mexico, where he is continuing his work as a mining and geological engineer.

Pat Grosscurth, who is in charge of the Rhodesian Selection Trust Research Laboratory at Kalulushi, has resigned to accept an appointment with the Havelock Mine (Asbestos) in Swaziland Protectorate.

John R. Bogert, former chief geologist for the National Lead Company in Argentina, is now employed as chief geologist for Mining, Management and Manufacturing, Inc. of Flemington, New Jersey.

Graham Hall, manager of mines for Electrolytic Zinc Company of Australasia, recently visited Bunker Hill mine operarations at Kellogg, Idaho. Mr. Hall's headquarters are in Rosebery, Tasmania, an island state south of Melbourne, Australia.

Fred A. Scheuer, formerly a consulting engineer in Los Angeles, is now employed as mine industrial engineer at the Ray plant, Ray Mines Division, Kennecott Copper Corporation. Mr. Scheuer received his engineering training at Mexico City College, and his Master of Business Administration from the University of Houston in 1953.

Mr. Sewell Millett, formerly associated with Appalachian Sulphides, Inc., in Jefferson, North Carolina, has rejoined the company as mining engineer.

Ralph S. Archibald, chairman and former president of North Range Mining Company, Negaunee, Michigan has been chosen to receive the Daniel C. Jackling Award and to give the Jackling lecture at the annual meeting of the American Institute of Mining, Metallurgical and Petroleum Engineers in San Francisco next February. The award is given annually by AIME for "significant contributions to technical progress in the fields of mining, geology, and geophysics."

Edward D. Tierney, general superintendent of the Great Falls Reduction department, has been appointed an assistant to **Chester H. Steele**, vice president in charge of Western operations of the Anaconda Company.

E. W. Grant is new assistant general manager at Braden Copper Company, Chilean subsidiary of Kennecott Copper Company. Mr. Grant received his mining engineering degree from Connecticut University and has been with Braden since 1941.

Ventures, Limited directors recently announced the retirement of **D. Barrington** as president and his subsequent election as president of the Board. **H. J. Fraser**, president of Falconridge Nickel Mines, Limited, was elected to succeed Mr. Barrington as president and managing director. **J. S. D. Tory**, Q.C., retired as chairman of the Venture's board but will continue as general counsel. **H. S. McGowen**, LaLuz Mines, Limited, was appointed vice president and general manager of Venture's, and **G. T. N. Woodrooffe**, secretary and treasurer of the company, was appointed vice president of finance.

Al Karman and **Samuel Moore**, American engineers with Point Four, Mining Administration, are compiling a very interesting geological study in the Andacollor District of Northern Chile for the Chilean government. They report the discovery of large deposits of low-grade copper.

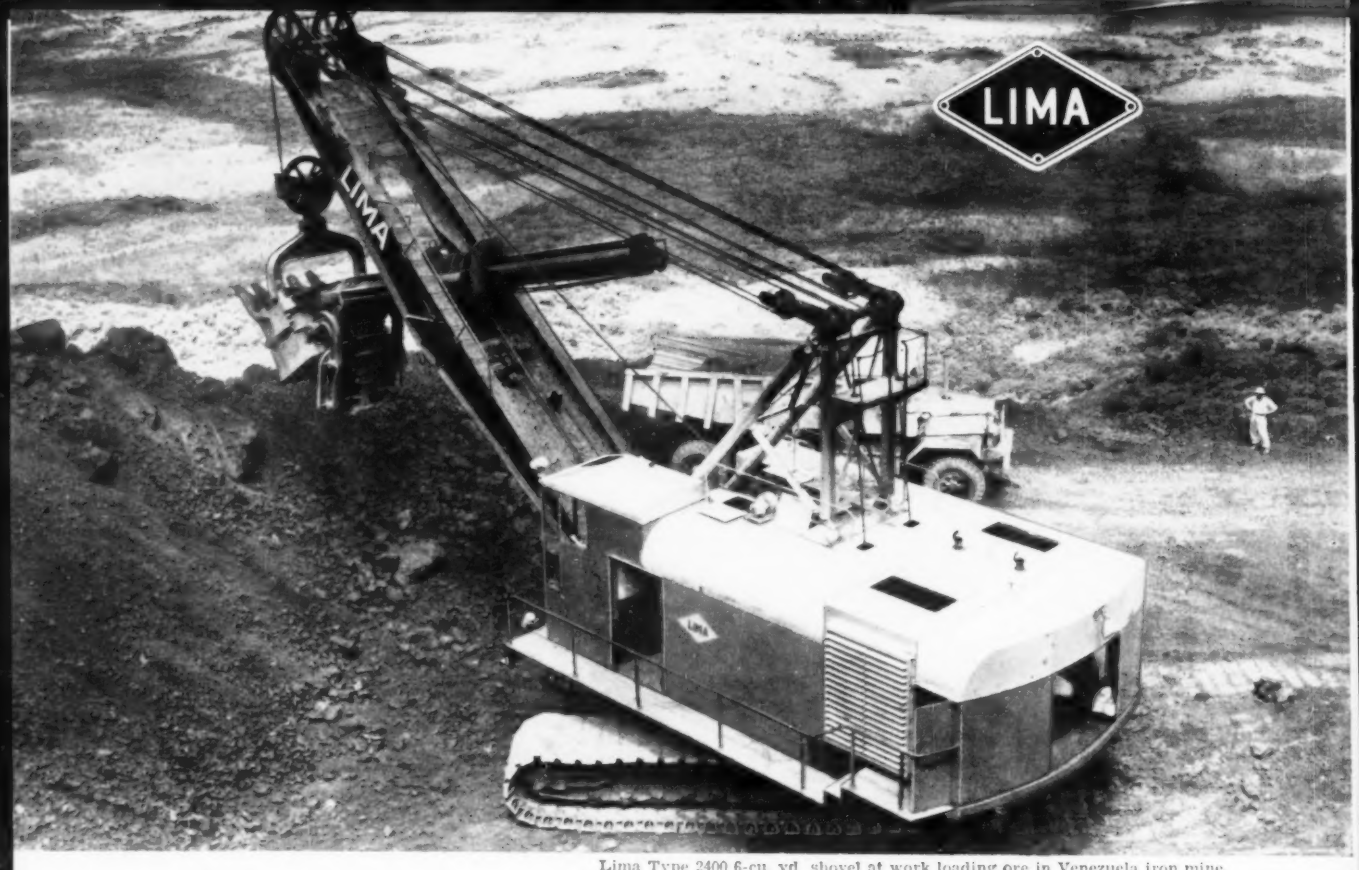
A group of four geologists, representing Chile, Ghana, and the Philippines, arrived in Washington, D. C., recently to participate in a seven-month photogeological Survey and sponsored by the State Department. Primary emphasis will be placed on teaching geological interpretation of air photographs. Included in the group are **Gabriel Perez** R., Geological Institute, Santiago, Chile; **L. A. K. Quahsie**, Ghana student at the University of Missouri; **B. K. Pentsil**, Ghana student at University of Michigan; and **Diosdado R. Andal**, Bureau of Mines, Manila, The Philippines.

Harold E. Lee

Charles E. Schwab

Richard A. Young

The State Department appointed four United States observer-delegates to attend the nine-nation meetings on copper, lead, and zinc in Geneva, Switzerland. Pictured above are three of these men, HAROLD E. LEE, vice president in charge of research and development, Bunker Hill Company, advisor on lead matters; CHARLES E. SCHWAB, assistant to president, Bunker Hill Company, representing the domestic industry's Emergency Lead-Zinc Committee; and RICHARD A. YOUNG, vice president, American Zinc Lead & Smelting Company, representing the smelting industry. Officially entitled the United Nations Commodity Commission's International Conference on Copper, Lead and Zinc, the meetings aim at finding ways to control international production and exports and to devise a working agreement for such controls. A similar meeting was held in London last September.



Lima Type 2400 6-cu. yd. shovel at work loading ore in Venezuela iron mine.

THE LIMA TYPE 2400...
muscled for the big mining jobs

Quality does pay off. As hundreds of mining operators have found, Lima's extra engineering features and precision construction mean greater tonnages, higher profits.

When the going is tough, there is no substitute for these Lima Type 2400 quality features:

Crawlers are wide and long for generous ground contact and ease of handling.

Tread rollers have specially hardened rims to resist wear . . . have dirt seal rings and retainers.

Drums are extra wide, with large diameters . . . advantageous when operating as a dragline, crane or high-lift shovel, because of greater cable capacity.

Anti-friction bearings at all important bearing points, including the drums.

Extra-large air-operated clutches respond instantly to the slightest movement of the controls, reducing operator fatigue.

Torque converter increases output, reduces shock loading, prevents engine stall . . . cushioned effect of drive lengthens cable life, lowers machinery maintenance. Standard on Type 2400.

All gears, smaller parts and shafts that are subjected to extra wear are flame or induction hardened for longer life.

There is a Lima for every kind of mining operation. Shovels ½ to 6 cu. yds., cranes to 110 tons and draglines variable. Get full details on these powered-for-profit machines from your nearby Lima distributor, or write to Construction Equipment Division, Baldwin-Lima-Hamilton Corporation, Lima, Ohio.

Lima Type 604 1½-cu. yd. shovel and Lima Type 1201 3-cu. yd. shovel loading iron ore on Mesabi Iron Range.

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Chemistry of Cyanidation, with an added section: Arsenic and Antimony Sulphide Minerals in Cyanidation

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This authoritative bulletin on cyanidation of precious metal ores, first issued in 1950, has been reprinted with an added section, Arsenic and Antimony Sulphide Minerals in Cyanidation. Check the table of contents below for a listing of the factual, useful information contained in this new issue of Mineral Dressing Notes. Send for your copy with the coupon below.

For over 40 years, Cyanamid has been supplying the mining industry with AERO® Brand Cyanide and technical "know-how". Backed by the years of experience of its field engineers located in the major mining areas of the free world, and the services of its Mining Chemicals Laboratory, Cyanamid is best fitted to serve you with both a wide variety of mining chemicals and valuable in-the-mill assistance.

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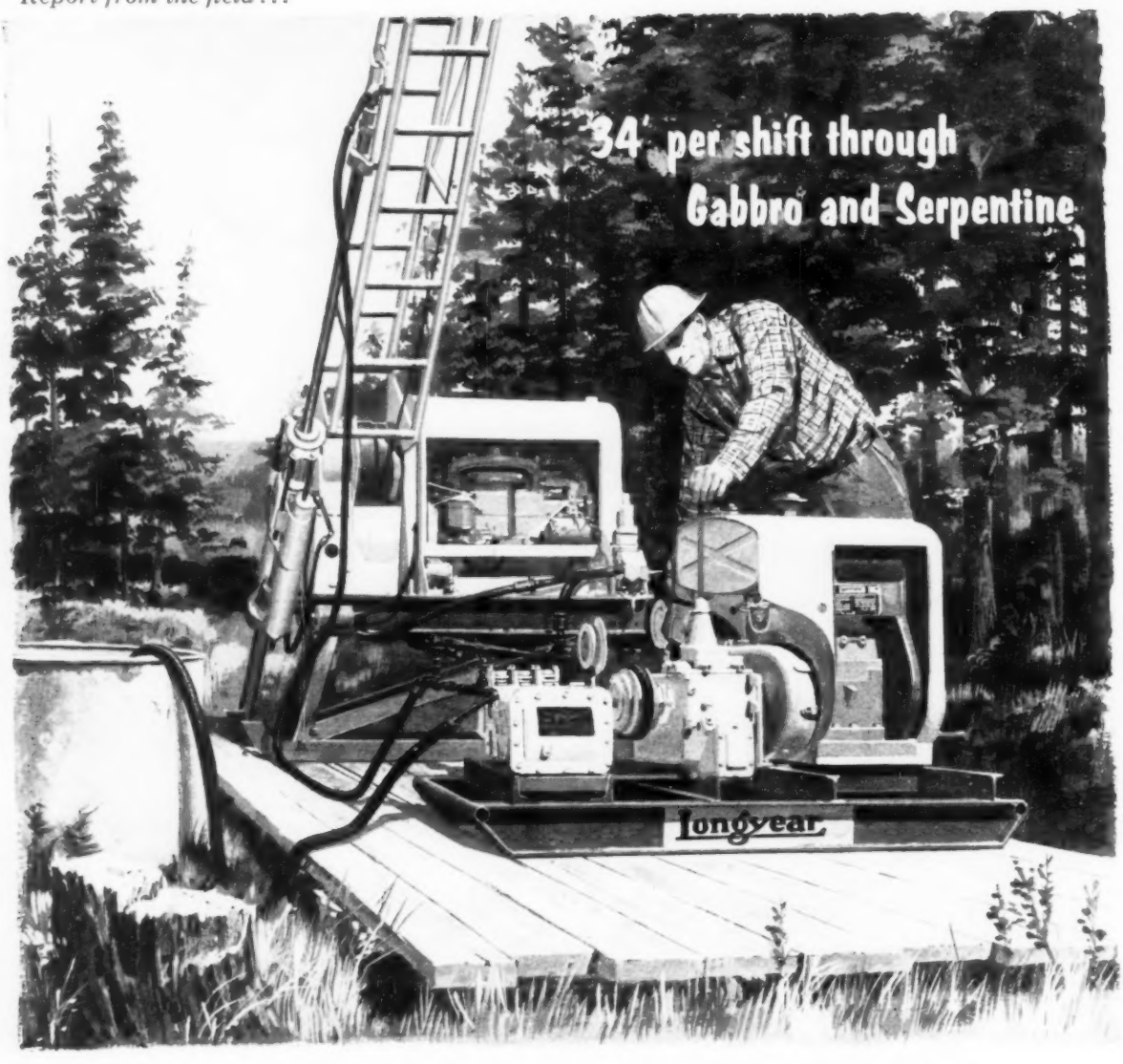

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This USS "T-1" Steel bucket holds about 29 cubic yards loaded due to the unique fabricated lip design worked out by Mr. Miller. The former 25-yard rated bucket actually retained about 24 cubic yards loaded.

Warren Miller, master mechanic for Maumee Collieries Co., Terre Haute, Indiana, designed and built this bucket for one of the firm's large dragline rigs. He knew that capacity could be raised, over-all weight reduced and maintenance simplified if he fabricated the bucket entirely from plates of USS "T-1" Constructional Alloy Steel of 321 Brinell hardness.

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Take it from the man in the driver's seat... here are big reasons

why operators recommend ...to increase your daily

"The International Payscraper does not nose over or up in tight spots," states Operator Cecil Dickson, for C. & Z. Construction Co., Memphis, Tenn. The three "75's" in this fleet each get a heaped 22-yard load in 25-32 seconds—with the TD-24 as pusher. The job: building farm-to-market road near Covington, Tenn.

Operating safety is essential on mountain terrain. Ripon Construction Co., working near Weaverville, California, appreciate International "75" Payscraper safety — handling a subcontract on a road in mountainous Trinity County, with three "75's" and two TD-24's for pusher power. Cuts run to 75 feet deep!

Payscrapers production!

This new TD-20 is pusher for a pair of fast-loading "55" Payscrapers—on a street improvement project in Denver. Horn Construction Co. is the contractor.

Riding on the shock-absorbing, deep-padded seat, the International Payscraper operator soon learns he can cross rough spots—ascend or descend steep pitches, loaded or empty—without neck-snapping, spine-smacking jolting or bouncing. He practically gets automotive riding comfort!

When he needs positive braking, he has powerful, heavy-duty four-wheel air brakes—synchronized on both tractor and scraper wheels—to decelerate and stop surely, even with heap loads on steep grades. And for "walking" the rig through soggy going, he has auxiliary hand-braking of the individual drive wheels!

Guiding a big earthmover is no longer an athletic event—no longer demands "muscle" or tussle! The Payscraper gives him exclusive Hydro-Steer—hydraulic steering powered for smooth, positive one-hand turns! Even the clutch is air-assisted for operating ease and fast, positive action!

And an operator has no fear of "nose-diving" or jack-knifing—not with International Payscraper design! The oscillating hitch assembly and forward pitched spindle prevents these machine contortions! Low center of gravity means extra stability, too, on uneven terrain.

These are big reasons why operators have the confidence to use full Payscraper power and speed—to give you full capacity and cycle-speeding loading, hauling, and return!

"Our three '55' Payscrapers are best for our land clearing and stripping needs in this sandy area—and we compared thoroughly with competitive machines," states Tom Hutchinson, for Hutchinson Bros., Inc., Pompano Beach, Fla. "We like the way the '55's' boil up a full load fast; then get to the fill and back quick."

Get in the driver's seat—get the operator's feel of International Payscraper performance. See for yourself what a big factor complete operating ease and confidence can be in increasing earthmover capacity! See your International Construction Distributor for a demonstration!

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Arizona Companies Mine, Mill, Blend, and Sinter Many Types of Manganese Ores for Carlot Program

Arizona manganese mines and mills are operating at a very high rate. Some are producing direct shipping high grade for the government's carlot program; some low-grade producers are shipping to blending plants; still others are operating their own mills. Mohave Mining and Milling Company is especially busy producing carlot grade concentrates by treating and retreating ores and concentrates in its mill and sintering plant at Wickenburg. A roundup of some of the state's manganese activity reveals the following:

Four individual groups are now working on the Metate 3 and Metate 3 Extension manganese claims, located in La Paz district of Yuma County. The four operations, employing a total of 20 men, are headed by Ernest Daniels, Sammy Daniels, Jesus Daniels, and Joe Cornwall, all of Blythe, California. In addition, Charles Hart and associates are said to be planning a large stripping operation for this winter on the Metate 4. Jesus Daniels, Sammy Daniels and Joe Cornwall are mining an extensive bulldozer pit, 200 feet long and Y shaped. The overburden was 20 to 25 feet deep over most of the stripped area. Also, there are 4 shafts open, the deepest being 130 feet. Ore is hauled from shafts and open pits to a central stockpile, then trucked by Wells-Cargo to railroad. The present grade is said to run from 50 to 55 percent manganese.

H. C. Smith and associates of Globe are continuing manganese production from the Black Jack mine, 42 miles southwest of Casa Grande. The mine employs 11 men, five on the day shift and six on the night shift. Access to the mine is gained by a 90-foot 60-degree inclined shaft with drifts both directions from the shaft on the 90-foot level. The hoist is gasoline-engine driven and is equipped with a ⅝-inch cable and skip bucket. The ore, which is reported to average about 35 to 40 per cent manganese but containing considerable fines, is sent to the Stovall blending plant at Casa Grande.

Brown and Robinette of Wenden are employing 22 men in their mining and milling operations at the Price and Priceless manganese property in the Artillery Peak area. About 25 tons of ore per hour are being handled at the recently constructed mill, making approximately 60 tons per day of 30 percent manganese concentrate. Recovery is by Pan-American jigs—five roughers and one cleaner. The concentrates go to Mohave Mining and Milling Company for further processing to meet marketable specifications.

Milling operations were resumed in September by Mansona Minerals, Inc., at Wickenburg. The company is now treating 150 tons per day of manganese ore from the Black Warrior, Shannon, Lewis, Peterson, and other properties in the immediate vicinity of the plant. The high-media and jig concentrates are sent to the Stovall blending plant at Casa Grande for up-grading to GSA specifications. A crew of 14 men is employed regularly in mining, milling, trucking and office operations.

Operations at the Crescent Mining Company's manganese properties, seven miles north of Mammoth, are employing a total of 30 men. Mining at the Crescent open pit is contracted to the Nelson-Belding Corporation of Los Angeles; milling is handled by the company. Mine production, varying from 300 to 500 tons per day, is trucked a distance of five miles to the mill site, then crushed and screened in a Universal portable crushing and screening plant. Equipment at the mine includes a 1½-yard diesel shovel and D8 Caterpillar bulldozer. The company's mill is operating three shifts daily, treating about 350 tons per day and producing from 60 to 65 tons of concentrates. The sintering grade and middlings are sent to the Mohave Mining and Milling Company, or to Holken Mining Company at Winterhaven, California, for further treatment; the metallurgical grade is shipped under the GSA manganese carlot program.

V. C. McCutchan of Miami has completed the 70-degree inclined shaft to a depth of 165 feet on the Magnet vein at the New Dominion mine. A drift on the 140-foot level underlies the present stope. Currently, McCutchan is shipping about 200 tons of 30 percent manganese ore per month to Mohave Mining and Milling Company.

Ray Mines Expanding Mill to 22,500 Daily Tons

The new expansion program just started by Kennecott Copper Corporation's Ray Mines Division at Ray, Arizona will be headed up by Elmer E. Speers, formerly general mill foreman for Kennecott's Utah Copper Division.

Included in the new construction program will be a 7,500-ton ore bin at the Ray mine and the erection of the secondary crusher, fine-ore storage bins, additional grinding and flotation sections, and conveyor facilities at the Hayden plant. The fine-ore bins and the new grinding sections will increase the capacity of the mill from the present 15,000 tons per day to 22,500 tons. Contract for the work is held by Stearns-Roger Construction Company of Denver.

Inspiration Consolidated Copper Company at Inspiration, Arizona has returned to a six-day work week. The decision resulted from the reduced copper inventory and better sales outlook. At the company's *Christmas* mine at Winkelman, total expenditures for development during the first nine months of 1958 amounted to $537,010, compared with $879,378 in the same period of 1957. Of this amount, $167,822 was spent during the third quarter of the year when deepening of the development shaft to the 1,600 level neared completion. This operation is under the direction of Norman G. Thompson, mine superintendent.

Mining and milling operations at the *Iron King Branch, Shattuck Denn Mining Corporation*, Humbolt, Arizona, are being maintained at the normal rate of around 1,000 tons per day. The mill process—flotation with cyanidation of the flotation tailing—results in two products, a zinc concentrate assaying about 59 percent zinc and a lead concentrate assaying about 30 percent lead. Most of the silver and some of the gold values are recovered in the lead concentrate, and additional recovery of precious metals is made in the cyanide circuit. Ore production comes from the north of the shaft on the Nos. 14, 15, and 17 levels. Principal development work is drifting on the No. 19 level, and deepening the shaft which is down about 2,450 feet. Dan M. Kentro is resident manager, employing a crew of 225 men.

Magma Copper Company reports a total production of 142,407,454 pounds of copper from its Arizona properties during the nine months ending September 30, 1958. This output was divided between its two producing properties as follows: *Magma* mine, 31,679,440 pounds; *San Manuel* mine, 110,728,014 pounds. Comparable figures for the like period in 1957 were: Magma mine 31,-090,490 pounds; San Manuel mine, 86,-692,164 pounds, for a grand total of 117,782,654 pounds.

Ray Mines Division of *Kennecott Copper Corporation* at Ray, Arizona, has returned to a seven-day operating schedule. Employes will work a five-day week and the plant will operate seven days, A. P. Morris, general manager, explained. Recall notices are being sent to men on the lay-off list to cover the increased labor requirements. This is the third increase in work schedule for the Ray Mines Division since August. At that time, operations were increased from a four to a five-day work week; then, in September, to a six-day work week.

Phelps Dodge Corporation has increased the working schedule at its Arizona mines to the equivalent of a six-day work week. This was the corporation's third increase in less than two months, the mines having gone to a five-day week September 3, then to five and one-half days October 1. The new schedule applies to operations at Ajo, Bisbee, Douglas, and Morenci, and is expected to restore about 8,000 tons of the 8,500-ton monthly cut in output which Phelps Dodge had taken during the height of the curtainment program.

The *Woodson Exploration Company*, with holdings near Cameron, Arizona, has completed a heavy stripping job and expects to begin shipping uranium ore to the *Rare Metals Corporation of America's* mill at Tuba City this month. Shipments at the rate of 500 to1,500 tons per month are planned. R. M. Gammell is engineer in charge.

The *Arizona State Land Department* has granted permission to *Phelps Dodge Corporation* to construct a dam and reservoir on East Clear Creek, a tributary of the Little Colorado River, and to appropriate 11,000 acre feet of water per annum for mining purposes. The water will be diverted into the Salt River watershed. The dam is to be known as the Blue Ridge Dam and is located about 50 miles southwest of Winslow.

The *University of Arizona College of Mines* will offer an educational program and symposium on "The Application of the FluoSolids Reactor to the Mineral Industry" early in 1959. First part of the program will be held from February 23 through 27th. It is designed for engineers who will have control or be directly or indirectly connected with the operation of a FluoSolids reactor. The program will

consider fundamentals of chemistry, physics, mathematics, stoichiometry, and metallurgical thermodynamics as they apply to the reactor. The college will use its four-inch FluoSolids reactor, the only one owned by a college of mines for instructional purposes, for laboratory instruction. A symposium will form the second part of the program on March 2 and 3. It will be devoted to technical papers, a panel discussion, and a trip to the new Hayden smelter of *Kennecott Copper Corporation*. Additional information may be obtained by writing to Professor Sigmund L. Smith at the college in Tucson.

Inspiration Consolidated Copper Company, Inspiration, Arizona, reports that its first sales of finished molybdenum concentrates were made during the third quarter of the current year. Production of by-product molybdenum was started during the second quarter following completion of the plant for retreatment of the copper concentrate to recover the minor amounts of molybdenum contained. The company has estimated that the molybdenum plant investment—close to $600,000—will be recovered out of earnings within two years after full production is underway.

CALIFORNIA

The *White Mountain Lead Company*, new owner of the *Mexican* lead-silver mine east of Bishop, California, plans to reopen the property. A two-mile mine access road will be built and a centrifugal pulverizer type mill installed. Production is to get underway next spring. Part of the operation will be by open pit.

A barite discovery has been reported in Ritter Canyon, 15 miles east of Caliente, California. The property is owned by Emil Ritter. An access road to the property has been built, and test work is continuing.

NEVADA

Apex Uranium Inc. is awaiting an AEC decision regarding construction of a uranium mill near Austin, Nevada. Construction is scheduled to begin within 45 days after receipt of an AEC contract. The mill would treat custom ore from the Austin area, as well as ore from the firm's own *Apex* mine.

The *Nevada State Highway Department* is reported to be considering building of a mine access road to the *Eagle-Picher Company* diatomite property. The new route would greatly shorten the distance from the mine to Lovelock.

Work is continuing at the *April Fool* property near Manhattan, Nevada. A shaft has been sunk 35 feet and about 55 tons of gold ore have been removed. The ore is being stockpiled for the present time. The discovery was made by *White Caps Mining Company* while do-

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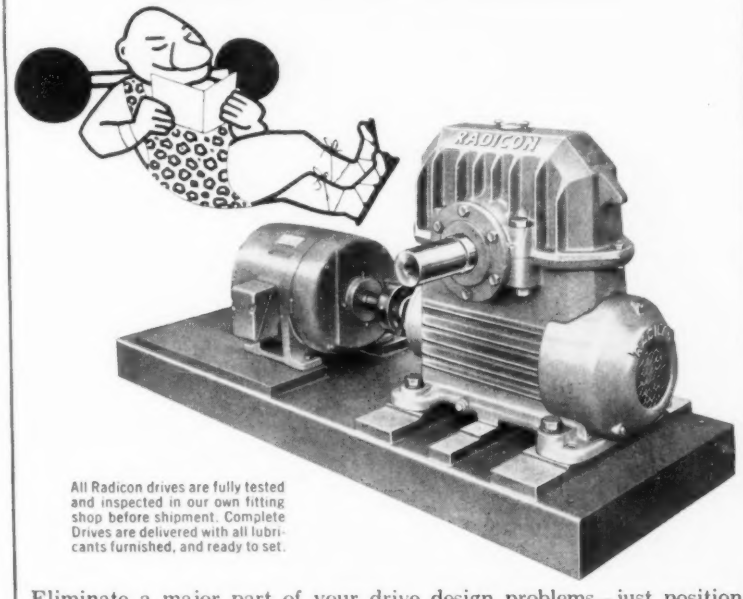

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ing assessment work on the property. Meanwhile, at the *White Caps* mine nearby, a 22-ton shipment of gold, cinnabar, and antimony was sent to a Los Angeles smelter for refining and test purposes. The results will aid in developing a flowsheet for a proposed mill at the White Caps property.

NEW MEXICO

The *Potash Division* of *International Minerals and Chemical Corporation* hoisted the 10,000,000th ton of langbeinite ore ever hoisted commercially in the world at its Carlsbad, New Mexico property in October. (International is the only firm in the world mining langbeinite commercially.) The ore came from the 800-foot and 850-foot levels, but all current langbeinite production is coming from the lower level.

In an action brought at Albuquerque, New Mexico, by C. Kremer Bain, St. Louis mining engineer, against *McKenzie & Whittle Contractors*, United States District Judge Waldo H. Rogers last June held that McKenzie and Whittle were using Bain's patented method for shaft sinking in an operation near Carlsbad, New Mexico. The shaft was being sunk for *Farm Chemical Resource Development Corporation* for the mining of potash. Judge Rogers held that McKenzie & Whittle should pay Mr. Bain royalties for the use of his method and that incidental charges in the shaft sinking did not free the user from an obligation to pay royalties.

Gibralter Minerals Company of Plainview, Texas is developing the *Hornet* and *American* lead, zinc, and silver mines, eight miles west of Hachita in Grant County, New Mexico. An 85-ton mill is located at the mine. Operations are scheduled to start early in 1959. Lou Jordan is general manager.

TEXAS

The *Palangana Corporation*, a subsidiary of *Union Carbide Corporation* and *Columbia-Southern Chemical Corporation*, reportedly is negotiating with the *Atomic Energy Commission* for permission to erect a uranium mill in Duval County, Texas. Exploration drilling has located about 1,000,000 tons of ore in the Goliad sandstone at depths from 175 to 350 feet. This ore is found directly over the top of the anhydrite capped Palangana salt dome. Uraninite and pyrite are found coating sand grains. In the late 1920's the area was an old field when the sands produced 6,600 barrels of oil. Union Carbide has not yet announced mining plans for this unusual ore body.

The *Pan American Sulphur Company* of Texas has announced that it produced 603,000 long tons in the first nine months of 1958, an increase of 88,000 tons over the same period of 1957.

Northwest's Large Pb-Zn Producers Increase Output

Recent lead-zinc price increases have prompted the Bunker Hill Company and Pend Oreille Mines & Metals Company, largest producers of the metals in Idaho and Washington, to return to five-day work weeks from four days.

Bunker Hill has also recalled 100 laid-off workers, put its lead smelter at Kellogg on a six-day work week (from five days), and reactivated one of two idle units at its electrolytic zinc plant. At last report, the firm was operating at 80 percent of capacity, compared to 65 percent last August.

Pend Oreille, which operates in northeastern Washington's Metaline District, expects to be producing 55,000 to 60,000 tons of ore monthly by year's end, compared to 45,000 to 50,000 tons earlier this year.

Most other area operators, however, indicated still better prices were needed to warrant production increases or reopening of closed mines.

Magnetic iron ore is being mined on Iron Mountain, Washington County, Idaho, by *Shasta Mining Company*, a Weiser corporation organized last June. The firm is using wet and dry magnetic separators, screening equipment, two tractors, two loaders, and a 1½-yard power shovel. Some finely powdered ore has been shipped to *Oregon Portland Cement Company* at Lane and some coarser material to *M. A. Hanna Nickel Smelting Company* at Riddle, Oregon. B. C. Davis is manager.

Despite the poor market outlook for tungsten, *Salmon River Scheelite Corporation* is completing a $90,000 government-approved tungsten exploration project in Custer County, Idaho. An ore shoot found by diamond drilling is less than 250 feet ahead of the present face. Future mining operations, however, depend upon a substantial improvement in the present price of tungsten trioxide. Developed ore reserves are estimated at 150,000 tons which can be mined and milled at a cost of about $30.00 per 20-pound unit of tungsten trioxide. Harvey Penny of Salt Lake City is company president. Robert M. Barrett, Salt Lake City financier, is doing the present work under a profit-sharing lease. Frank A. Taft is mining engineer in charge.

Excellent-grade lead-zinc ore has been found over a three-foot width in a diamond drill hole in *Coeur d'Alene Syndicate* ground near Gem, Shoshone County, Idaho. Exploration is being done by *Black Bear Silver-Lead Mines*, which is controlled by *Metropolitan Mines Corporation*, from an east drift off the main Black Bear adit. The area being explored lies between the old *Frisco* mine of *American Smelting and Refining Company* and the *Bunker Hill Company's Star* mine holdings.

Western Fluorite Mining Company has had five men operating heavy equipment at its uranium mine in Custer County, Idaho's East Basin Creek area. Fifteen hundred tons of ore has been shipped to *Vitro Uranium Company's* Salt Lake City processing plant and management hoped to have an additional 4,000 tons mined before winter conditions forced a shutdown. Further determination of ore reserves by rotary drilling also was planned. Hank Childs is superintendent.

Sidney Mining Company, operator of a zinc-lead mine near Kellogg, Shoshone County, Idaho, has acquired a uranium prospect in Custer County's East Basin Creek area and another in the adjacent Coal Creek area. Bulldozer exploration has exposed interesting mineralization but additional work is not planned until spring. Adjacent holdings are held by *Western Fluorite Mining Company* and *Rare Metals Corporation of America*.

Hecla Mining Company may obtain control of *Lucky Friday Silver-Lead Mines Company*, newest major producer in the Coeur d'Alene Mining Region, Shoshone County, Idaho. Hecla has taken an option to buy 184,000 shares of Lucky Friday stock from two officials of the firm for $1,380,000, or $7.50 a share, and is making a detailed examination of the *Lucky Friday* mine. Holders of more than 1,000,000 other outstanding shares would be made the same offer if the option is exercised.

Polaris Mining Company has been merged into its parent firm, *Hecla Mining Company*, on a basis of one share of Hecla for each six shares of Polaris. The merger increased Hecla's current assets to approximately $7,000,000. Incorporated in 1937, Polaris' holdings included the *Polaris* silver-copper vein system in the Silver Belt of the Coeur d'Alene Mining Region (Shoshone County, Idaho), being mined from deep workings of *Sunshine Mining Company*; the adjacent *Silver Summit* mine; control of *Chester Mining Company*, and working contracts with nearby *Mineral Mountain*, *Silver Standard*, and *American Silver Mining Companies*, *Merger Mines, Inc.*, and *Coeur d'Alene Mines Corporation*.

Three 1,000-foot diamond drill holes are being fanned out from the end of the two-mile *East Exploration Project* lateral driven from the *Silver Summit* mine, Shoshone County, Idaho, into the property of *Rainbow Mining & Milling Company*. A second raise on a silver-copper vein discovered earlier is up more than 135 feet in 30-ounce ore. *Polaris Mining Company* is doing the work at a depth of 3,000 feet.

Mineral leases approved by the Idaho Land Board: Elmo Shoup, Salmon, 160 acres for quartz mining in Lemhi County; Glenn Culver, Boise, 20 acres in Ada County for gravel; Michale Carroll, Boise, 40 acres for quartz mining in Valley County, and Ralph Puckett, Portland, Oregon, 40 acres for placer mining in Benewah County.

Low lead-zinc prices were blamed by *Clayton Silver Mines* for the layoff of two-thirds of its 30-man crew and suspension of mining and milling operations in Custer County, Idaho. Development work was cut to a five-day week. All operations were on a six-day week and production was about 3,000 tons of ore monthly. A $165,000 shaft-deepening project from the 500-foot level to the 800 was nearing completion, at last report. W. M. Yeaman of Yakima, Washington is company president.

Newton L. Matthews of Hailey, Idaho has been granted patents on an improved rock crusher design and on a multiple gravity and float concentrator featuring a rotating drum with a removable rubber lining and a unique arrangement of grooves and riffles.

Silver Buckle Removes Waste To Reach Uranium

More than 300,000 cubic yards of waste rock have been removed by Silver Buckle Mining Company of Wallace, Idaho to reach a uranium deposit in the Spokane Indian Reservation in northeastern Washington. In the picture above, G. L. Cloward, superintendent, looks over the big open-pit operation. Most of the overburden was removed with Caterpillar tractor scrapers. Conex Inc. of Ford, Washington has the mining and hauling contract. Silver Buckle has stepped up its uranium ore shipments from 750 tons to 1,000 tons weekly. Some of the ore is stockpiled at the uranium processing plant of Dawn Mining Company in Ford for winter milling. The custom milling contract provides for treatment of at least 60 tons daily. At last report, 5,000 tons of ore had been trucked to the mill. Uranium oxide content average 0.23 percent. The ore bed currently being mined is 15 to 20 feet thick in a conglomerate atop granite.

Directors of *Lead Blossom Mining and Milling Company* have approved turning the firm's two patented claims and a fractional patented claim in the Wardner area of the Yreka mining district of Idaho over to *Yreka United, Inc.*, for 100,000 shares of Yreka stock. Yreka has acquired large holdings in the area by sale or merger and is negotiating with the *Bunker Hill Company* for their deep development from a sea-level tunnel Bunker is driving from its *Crescent* mine to its *Bunker Hill* mine. Jerry Graber of Wallace is president of Lead Blossom.

Idaho Mining and Milling, Inc. is logging timber from land in Idaho County's Florence Basin so that a floating dredge can be put to work on gold-bearing sands and gravels of Meadow Creek next spring. The timber was purchased from the Department of Agriculture. Logging and grading for an air strip also is planned under a special use permit from the U.S. Forest Service. Philip W. Jungert of Lewiston, is president.

A blaze caused by a defective electric generator destroyed the surface plant of *Idaho Custer Silver-Lead Mines* at the old *Livingston* mine, Custer County, Idaho. Loss was estimated at nearly $20,000, but there was some insurance. Pumps went out and water flooded some mining equipment belonging to the operating firm, *Hecla Mining Company* of Wallace. Two men working underground escaped without injury. Alvo V. Alvensleben, Seattle, is president of Idaho Custer.

Good progress is being made on erecting the thorium ore concentrating plant for *Salmon River Uranium Development Inc.* near Salmon, Idaho. Mill machinery has been installed; power and water facilities installed and tested; and crushers and conveyors set in place. Mill building, pump house, and other necessary structures are about completed. Test runs are underway, and full production is expected shortly. Capacity is 100 tons per day, and can be increased if desired. William Wilcox is president of the firm.

Webster Decker and Wilford Sirrine have suspended work for the winter on a molybdenum prospect they had been exploring. They are expected to resume exploration next spring and may do some drifting. The claims, leased from Robert Hulin and associates, are located on the North Powder River in the Elkhorn Mountains of Baker County, Oregon.

A $909,500 contract reportedly has been awarded to *Dravo Corporation* of Pittsburgh, Pennsylvania for construction of a 900-ton-per-hour traveling bulk unloading tower. The tower will be part of new facilities erected for the Portland, Oregon Commission of Public Docks. Including also are a new pier, and storage yard at the commission's terminal No. 4 to help handle increasing shipments of imported ores and concentrates.

The *California-Oregon Chrome Producers Association* met in Cave Junction, Oregon recently to form the group into a cooperative. Since completion of the GSA stockpile in May, all chrome mines in Oregon and California have shut down. It is the plan of the new group to investigate the possibility of marketing chrome ore as ferrochrome manufactured in a cooperative-owned electric furnace.

Phil Parks Jr., Roy Matchett, and G. I. Bryant are shipping mercury from the *Four Square* group of claims leased from Lakeview, Oregon interests

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COMING CONVENTIONS

December 1. Annual Membership Meeting, AMERICAN MINING CONGRESS, Hotel Plaza, New York, New York.

December 5 and 6. The 64th Annual Convention of the NORTHWEST MINING ASSOCIATION, Spokane, Washington.

March 1st to 4th, 1959. The 27th Annual Meeting and Convention of the PROSPECTORS AND DEVELOPERS ASSOCIATION, the GEOLOGICAL ASSOCIATION OF CANADA, and the MINERALOGICAL ASSOCIATION OF CANADA. Royal York Hotel, Toronto, Ontario, Canada.

January 12, 13, and 14, 1959. University of Minnesota MINING SYMPOSIUM and the Annual Meeting of the MINNESOTA SECTION, AIME, Hotel Duluth, Duluth, Minnesota.

February 5, 6, and 7, 1959. Annual Western Minerals Conference and Centennial Celebration sponsored by the Colorado Mining Association and affiliated groups. Shirley Savoy Hotel, Denver, Colorado.

February 15 through 19, 1959. Annual Meeting, AMERICAN INSTITUTE OF MINING METALLURGICAL AND PETROLEUM ENGINEERS, San Francisco, California.

February 23 through March 4, 1959. Educational program and Symposium on THE APPLICATION OF THE FLUOSOLIDS REACTOR TO THE MINERAL INDUSTRY, University of Arizona College of Mines, Tucson, Arizona.

MONTANA

American Chrome Company's $500,000 high carbon, ferrochromium pilot plant at Nye, Montana is scheduled to go into operation this month, about two months behind schedule. The delay was caused by slow equipment deliveries by suppliers. Initial output is to be about five tons daily, and this to be increased to 15 later.

The *Anaconda Company* has reopened its *Anselmo* zinc mine at Butte, Montana. Production was stopped several months ago because of a major breakdown in the zinc concentrator at Anaconda. The work week for the *Mt. Con* underground mine and the *Berkeley* open pit mines has been increased from five to six days; however, the employees are still on a five-day basis.

C. E. Erdman of the *United States Geologic Survey* reported to the *Interdepartmental Advisory Council on Natural Resources* that his agency has 21 mapping projects underway in Montana covering about 13.5 percent of the state's total land area. He believes it will take about four years to finish this part of the program.

WASHINGTON

Daybreak Uranium, Inc. is test drilling a newly discovered mineralized zone which it found by surface stripping leased ground east of its *Dahl* lease open-pit mine in the Mount Spokane district, northern Spokane County, Washington. Sixty-five tons of autunite were removed from a bulldozer trench. At the original open-pit discovery, *Addy Development Company* is driving a 5 by 7-foot development drift along a mineralized shear zone outlined by downhole drilling from the surface. Kae Sowers of Opportunity is Daybreak president, and H. W. Norman, manager of mining and exploration.

Northwest Magnesite Company has resumed operation of a sixth kiln at its Chewelah, Stevens County, Washington operation. Howard Ziebell is general manager.

Dawn Mining Company is producing 1,300 to 1,400 tons of uranium ore daily from three open-pit operationss in the Spokane Indian Reservation, Stevens County, Washington. *Isbell Construction Company* of Reno, Nevada has the mining contract. *Vic-Ore, Inc.* of Spokane trucks the ore to Dawn's $3,500,000 processing plant at the eastern entrance to the reservation. The three firms employ a total of about 50 men in mining-hauling. Substantial amounts of uraninite have been found beneath the oxidized autunite zone but there is little difference in the average grade of the ores. J. J. Crowhurst is Dawn manager. Pete Loncar and John Amberson are mine superintendents for Dawn and Isbell, respectively.

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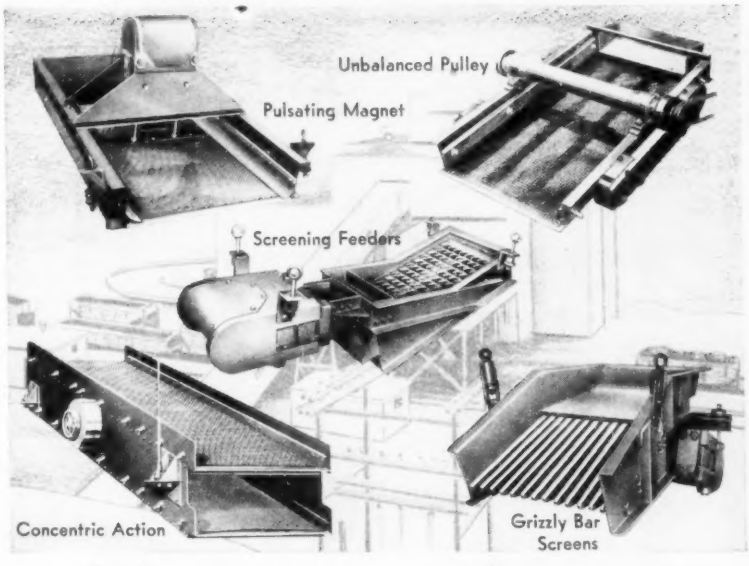

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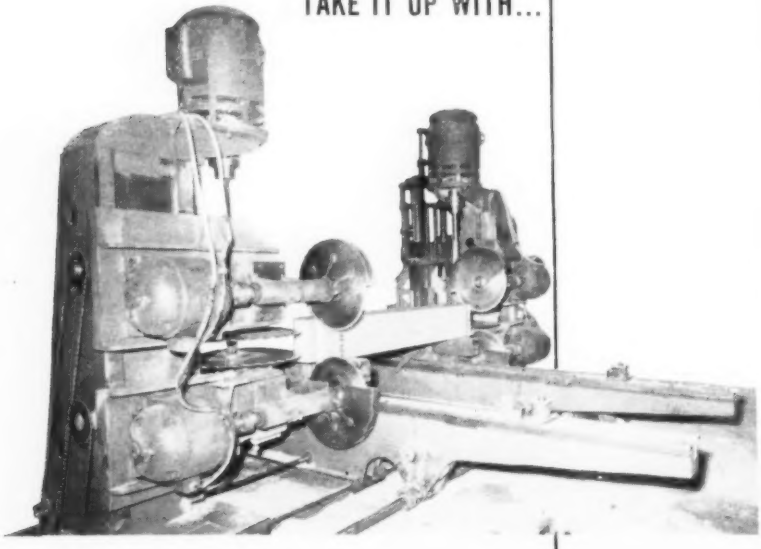

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The *Utex Exploration Company* of Moab, Utah is unwatering the *Cash* gold mine at Gold Hill near Boulder, Colorado, and plans development. Russell McClellan is the geologist.

The *Wah Chang Corporation* is milling thorium at its reconverted tungsten mill at Sugar Loaf in Boulder County, Colorado. Most of the ore comes from the Wet Mountain Valley south of Canon City. Earl Sweeney is superintendent in charge.

The *La Salle Mining Company* has discovered uranium ore near Jamestown, Colorado. Surface diamond drilling is contracted to *Boyles Bros. Drilling Company* of Salt Lake City, Utah. La Salle has staked 30 claims around the discovery. Cliff Doyle is superintendent of the company's operations. The firm is also currently operating two other Colorado uranium properties—the *Club Mesa* mine at Uravan, leased from the AEC, and the *Burro Canyon* mine at Slick Rock, leased from *Union Carbide Nuclear Company*.

Beaver Mesa Uranium Inc. of Grand Junction, Colorado reports an increase of 11,329 tons of ore mined over last year's operations. In this third year, the firm produced 66,483 tons assaying 0.28 percent U_3O_8, and 1.03 percent V_2O_5. Current production rate is 6,000 tons per month. The property is on the Beaver Mesa near the Colorado-Utah border.

New Idria Mining & Chemical Company, which owns large mercury and tungsten properties in California, reports a successful year of operation at its uranium property on Beaver Mesa, 40 miles southwest of Grand Junction, Colorado. It contributed a cash profit for the fiscal year before depreciation and depletion. With the aid of a DMEA loan, the division completed a drilling program which outlined a 14,000-ton ore body.

"CominCo" Cooperative Mining Company Ltd. reports that it has been shipping about 100 tons of uranium ore regularly from its property in the Dove Creek area of Colorado. The firm was purchased in January 1958 by Mrs. Margery T. Oates Skeels of San Francisco. H. C. Skeels was retained as general manager and heads the engineering department. Headquarters have been transferred from Phoenix, Arizona to San Francisco.

Filing articles of incorporation in Colorado recently were: *Gendev Corporation* of Colorado Springs, by L. K. Murray, George R. Herman, and Robert E. Jones; *Cywyd Mining Company* at Colorado Springs, by William J. Wyble, William A. Young, Ivan R. Young, and Will H. Claiborne.

American Gilsonite Company's $16,000,000 refinery at Gilsonite, Colorado has completed its first full year of operation. All phases of the project are reported to be operating successfully in excess of designed rates. The plant has been averaging 700 tons of gilsonite processed daily, yielding 1,300 barrels of high-octane gasoline and 275 tons of high-purity metallurgical coke. An important feature of the project is that the gilsonite ore is carried to the refinery through a 72-mile slurry pipeline from the mines in the Uintah Basin of Utah.

Lutah Uranium & Oil Company of Roswell, New Mexico is reported to be undertaking uranium mining operations near Edgemont, South Dakota. Gordon E. McMeen is president of the firm.

Recently incorporated in South Dakota were the following: *Dakota Beryllium and Oil Company* of Pierre and Edgemont, by Francis Michoud of Edgemont, Russell Laramie of Port Pierre, and Lester Ferley, Warren May, and Velma M. O'Reilly, all of Pierre; *Udiak Inc.* of Rapid City, by Roger Dering, Sheldon F. Elliott, and George J. Bills, of Salt Lake City, and John E. Goodrich of Rapid City.

Minerals Refining Company reports it has successfully produced high purity hydrofluoric acid from low-grade fluorspar ores in a pilot plant operation near Murray, Utah.

A 6,000-ton test shipment of phosphate ore has been shipped by *San Francisco Chemical Company* from its *Humphries* property near Vernal, Utah. The ore will travel a 275-mile route to the firm's new mill at Leefe, Wyoming.

Standard Uranium Corporation of Moab, Utah continues to expand its uranium reserves in the Big Indian District of San Juan County. Recent drilling and drifting on the south end of the property is estimated to have added more than 300,000 tons to the firm's reserves. The company hopes to tie in these reserves with the present mining face on the *Big Buck* claims to make an ore body more than 400 feet wide and about 2,000 feet long. Shipments from the Big Buck are about 8,000 tons a month.

Development drilling is underway at the Green River, Utah property of *Four Corners Uranium Corporation* to block out additional ore adjacent to the operating mines. The company hopes to find higher grade ore for blending with the low-grade material now accessible, and to develop new areas where high-grade ore has been suggested by previous drilling. Incline No. 11 at Green River is now ready for production of high-grade ore which will increase the average grade. In the first six months of 1958 the company mined 28,621 dry tons of ore averaging 0.23 percent U_3O_8, compared with 30,235 tons of 0.25 percent in the same period of 1957.

Kennecott Copper Corporation has returned to a seven-day week at all of its western mining operations. This is the third increase in production rate by Kennecott since August 1958. According to F. C. Green, general manager of *Utah Copper Division*, this division is now back at the rate that prevailed in 1957.

Chief Consolidated Mining Company of Eureka, Utah reports a five-foot vein of silver assaying between 16 and 20 ounces per ton has been found in the Enterprise area of Utah through a core drilling program. Indications are that the discovery is located below the water table, and it is now being studied for its economic value.

McFarland & Hullinger has suspended mining operations on the *Ophir* lead-zinc-silver properties leased from *United States Smelting Refining & Mining Company* near Tooele, Utah. Low prices for lead and zinc were cited as the reason for closing.

United Western Minerals Company of Santa Fe, New Mexico, has acquired the assets of five Utah firms. These are: *Zenith Petroleum Corporation, Sahara Uranium Corporation, Vega Corporation, Anticline Uranium Company*, and *Mount Peale Corporation*. The bulk of the leases acquired are in the Paradox Valley of Utah and concern oil and gas rights.

Robert G. Hamlin, vice president of *Hamilton Exploration and Mining Company*, has announced the first shipment of uranium ore from the company's new mine south of Turnercrest, Wyoming. Initial truckloads, shipped to the *Mines Development* mill at Edgemont, South Dakota, assayed 0.20 percent U_3O_8. Average depth of the ore is reported to be 15 feet.

The *Greater Wyoming Minerals Corporation* of Thermopolis has purchased two beryl claims in the Copper Mountain area of Fremont County, Wyoming. J. L. Brastrup, president, says that the company has also agreed to buy five other claims owned by the *Thermopolis Mining and Exploration Company*. Mining operations were begun on the property last April. Ore is being shipped to the government buying station at Custer, South Dakota.

Wyoming's first uranium mill outside of Fremont County may be located in Natrona County if the application of *Union Carbide Nuclear Corporation* is approved. The project was recently recommended to the *Atomic Energy Commission* in Washington by the commission's regional office in Grand Junction, Colorado. The plant is scheduled to have a daily capacity of 492 tons.

Northwestern Oil and Mining Corporation of Sheridan, Wyoming has moved into the Shirley Basin, Pumpkin Buttes, and Copper Mountain areas of central Wyoming, buying property from *Washakie Uranium Company*. Northwestern also reported that with stripping about one-half completed on its *Skyline* mine in the Gas Hills, a contract was signed for the removal of 150,000 yards of overburden.

Figures released by the *Atomic Energy Commission* noted 11,000,000 tons of uranium ore reserves in Wyoming, averaging 0.30 percent U_3O_8. The proved reserves in the state increased almost 2,000,000 tons between December 31, 1957 and June 30, 1958. The grade average increased 0.04 percent.

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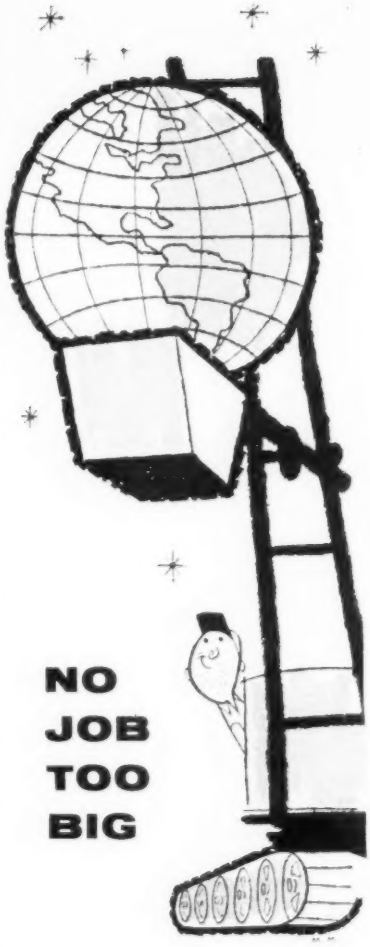

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St. Joseph Lead Company's "new" Lead Belt development at Viburnum, Missouri is proving a higher-grade deposit than the state's Lead Belt area. The new district is expected to produce ore containing from 3.5 to 4.0 percent lead; the Lead Belt ore averages 1.5 to 2.0 percent. Viburnum will be in production early in 1960, according to Andrew Fletcher, president of St. Joe. The *Pea Ridge* iron deposit being developed near Potosi, Missouri is scheduled to go into production in late 1962 or early 1963. St. Joe shares an interest in this operation with *Bethlehem Steel Corporation*. Their joint firm, *Meramec Mining Company*, is in charge of development. At present only small shops are to be built at Viburnum and Pea Ridge; the larger shops at Bonne Terre will be retained. The mining and milling operations of St. Joe in southeastern Missouri are back to a five-day week which will raise lead output by about 1,000 tons per months to a total of 10,000 tons monthly.

Calumet & Hecla Inc. is currently conducting exploration on its *Calumet* conglomerate lode at the Centennial No. 3 shaft in northern Michigan. The ninth level has been extended to the No. 6 shaft where test stoping has indicated copper ore. The company also is prospecting and exploring with the aid of electro-magnetic equipment. Both ground and aerial crews are at work. Mining continues in the Centennial No. 2, Ahmeek Nos. 2 and 3, Seneca, Allouez No. 3, and Osceola No. 6 shafts. Production is about 6,900 tons per day.

International Mining Corporation has acquired from *Waterford Oil Company* its 25 percent ownership in producing and nonproducing royalties, minerals, and fee properties in southern Louisiana. The firm paid $7,000,000 for the purchase.

Stanley Patterson of West Plains, Missouri has sold all of his mining equipment to the *Reichert Mining Company* of Piedmont, Missouri but is retaining his leases covering iron ore property around West Plains. The equipment included washer, trucks, power shovel, crusher, conveyors, pumps, bins, etc. The new owners will move the equipment to Piedmont. Mr. Patterson hopes to resume iron ore mining in the district when there is a better market for the ore.

American Zinc, Lead and Smelting Company's Young mine Friends Station, Jefferson County, Tennessee, has hoisted its 1,000,000th ton of zinc ore. From initial production in 1955, the daily tonage has increased to 2,000 tons. When full production is reached, 4,000 tons will be hoisted every 24 hours. This is the first mechanized mine in the East Tennessee zinc district. Drilling is done with Sanford Day jumbos, and mucking and tramming are done with Sanford Day gismos.

Mineral Mills, Inc. has been established in Pittsburgh, Pennsylvania to process magnetite. The firm has acquired the magnetic operations previously conducted by *Orefraction Inc.*, and will supply magnetite to companies cleaning coal, gravel, gypsum, and other minerals by heavy media separation and washing processes.

Commissioners of the city of Bartow, Florida are considering a request from the *Armour Fertilizer Works* for permission to mine phosphate on property it owns within the city limits. A major obstacle in the way of agreement is the section of a city ordinance which provides that if mining is done, the mined-out land must be leveled afterward by the mining company. Armour has proposed that it deed the land to the city after mining is completed, and that it pump tailings into the cuts in quantity to allow for leveling, but rows of overburden would also be left for the city to level at its own expense.

The *Bureau of the Census*, in cooperation with the *Atomic Energy Commission*, has sent out questionnaires to collect statistical information from private atomic energy manufacturers and processors to determine the extent of United States industrial participation in the program for peaceful uses of atomic energy.

Foote Mineral Company of Philadelphia, Pennsylvania has notified its stockholders that it expects to reduce rate of production of lithium in the summer of 1959 when its contract with the AEC will be completed. The AEC now purchases undisclosed tonnages of lithium hydroxide from Foote. This contract is to be completed by May 1, 1959, and the present industrial market for lithium hydroxide does not justify full capacity operation of the company's production facilities.

The *Reading Railroad* has completed the $540,000 unloading terminal at the Port Richmond Marine Terminal in Philadelphia, Pennsylvania. The new facility is expected to increase the railroad's ore unloading capacity by 85 percent, or about 200,000 tons annually. The new unit includes lightweight trolleys and buckets on two ore unloaders with new-scale mechanism for weighing the ore as it is unloaded.

Officials of *Vitro Corporation of America* and *Koppers Company Inc.* have signed a joint-venture agreement which enables *Vitro Laboratories* at Silver Spring, Maryland, and Koppers' *Metal Products Division* at Baltimore, Maryland to team in undertaking weapon systems work for the Department of Defense. Vitro's research and development facilities will be combined with Koppers' production facilities for an indefinite period and may involve a number of projects.

Jones & Laughlin Steel Corporation has awarded an engineering-construction contract to *Western Knapp Engineering*

Russian Miners Visit Cliff's Republic Mine

During their recent tour of United States iron ore mines, six leading Russian miners and metallurgists visited Cleveland-Cliffs Iron Company's northern Michigan operations. A good part of their visit was devoted to technical discussions with the Cliffs' staff. Mine and plant visits were included also. This photograph shows the visitors and hosts in front of a jet piercer at the Republic open pit. From left are: Robert Flynn, Cliffs' engineer; Harry G. Swanson, Cliffs' general superintendent; Ivan Yakolevich Grishchuk; Andre Borisovich Patkovskiy; Alexander Logofelt, interpreter; Mikhail Aleksandrovich Pokrovskiy; Ted Starr, interpreter; Rashid Abdullovich Kadyrbaev; Walter Carroll, Republic Steel Corporation; Ivan Semenovich Shytov; Hugh Leach, manager Cliffs' Michigan mines; Ivan Ivanovich Savitskiy; E. W. Lindroos, superintendent Republic mine; Joe Crites, Republic general foreman; and Clyde W. Nicholson, consultant-engineer, North Range Mining Company.

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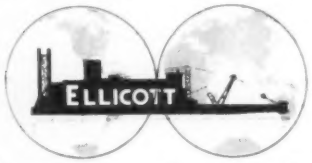

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Company of San Francisco for construction of an 800-long-tons-per-hour iron ore concentrator for the *Lind-Greenway* mine near Grand Rapids, Minnesota. Facilities will include a crushing, screening, and washing plant to produce merchantable concentrate from the wash ores of the mine. Current estimates indicate completion of the project by September 1959.

The *Pittsburgh Steamship Company's* ore carrying fleet on the Great Lakes closed the 1958 shipping season during the week of November 16th. Many of the *U.S. Steel* subsidiary's vessels actually made their final hauls in October, however. Shipments of iron ore in the lakes in October were 23 percent lower than a year ago. Movement for the season showed a 40 percent decrease, with shipments totaling 48,264,152 tons, compared with 80,529,544 in the previous year.

The *United States Treasury Department's Internal Revenue Service* has issued a pamphlet describing the work of engineers in the Revenue Service and employment opportunities. Entitled "Engineer Tax Men," the pamphlet may be obtained by writing to the Assistant Commissioner (Technical), (Attention: T:S:E), Internal Revenue Service, Washington 25, D.C.

The annual meeting of the Minnesota Section of the AIME will be held at the Hotel Duluth, in Duluth, Minnesota on January 12, 1959. It will be followed by a 1½-day symposium centering principally around the recent visit of three well known mining men to Russia. E. L. Ioppa, general manager of *Pickands Mather & Co.*, will report on his impressions of Russian mining methods and equipment. D. N. Vedensky, director of research and development for the *M. A. Hanna Company*, will describe the Russian beneficiation methods and plants. J. H. Strassburger, assistant vice president of *Weirton Steel Company*, will present a first-hand report on Russian steel operations. The remainder of the program will include a report by J. S. Breitenstein on the use of the R-N process for the direct reduction of Mesabi Range iron ores.

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EUROPE

SWEDEN—Preliminary work is underway for construction of a new uranium extraction plant in Sweden. The plant would treat ore from native schist deposits at Mt. Billingen in the southwestern part of the country. To be called the Ranstad Works, the new plant would produce 120 tons of uranium per annum, which presupposes the mining of 900,000 tons of crude schist. There is to be a sorting and crushing plant, leaching plant, and refinery. Total cost is estimated at $22,000,000, with an additional cost for the refinery. Operation is scheduled for 1962.

EIRE—First samples from the 1,600-foot bottom level of the *Mountain* mine being developed by *Can-Erin Mines Ltd.* at Allihies has returned high values. A section of massive chalcopyrite in a vein system over 50 feet in width returned 24.80 percent copper, according to the consulting geologist. A sample of dump material left by previous operators ran 14.0 percent Cu, while a sample of a vein identified as tetrahedrite gave 7.75 percent Cu, 0.94 ounce silver, and 0.14 ounce gold. Underground diamond drilling of a series of flat and down holes has been started to outline the ore zone on and below the 1,600-foot level.

AUSTRIA—*Bleiberger Bergwerks Union* A.G. at Arnoldstein in the province of Carinthia reportedly expects to have an output this year totaling about 11,000 metric tons of lead, and 10,000 tons of electrolytic zinc. About half of the lead ore and 60 percent of the zinc ore will come from the company's own mines, while the balance will be imported from Italy, or, in the case of lead, recovered from the secondary material.

FINLAND—*Otanmaki Oy*, reportedly plans to start mining operations next summer at Karvasvaara near Rovaniemi in Lapland. Iron ore deposits are said to have been discovered there which contain at least 800,000 metric tons of ore with an iron content of around 58 percent. Prospecting in the area continues.

THE NETHERLANDS—A unit for bulk storage of bauxite pending transshipment has been opened at the Waalhaven, Rotterdam. The plant was built for *Martinswerk, GmbH* of Bergheim, Germany, a subsidiary of the *Aluminum Industrie* A.G. of Zurich, Switzerland. The new unit has three silos, each about 100 feet high, for bulk storage. Previously the mineral had been shipped in sacks.

SPAIN—A growing interest in the Extremadura geological structure near the Portuguese border is being displayed by German geologists. This district already produces tungsten, tin, magnesite, hematite, and lead in considerable quantity. All ore is shipped through the port of Huelva.

RUSSIA—A group of 13 United States engineers visited Russia recently to inspect automatic factories and research institutes where automatic control systems are developed. Included in their 18-day tour were plants in Moscow, Leningrad, and L'vov, as well as the *Central Technical Institute of Moscow*. The group was sponsored by the *American Automatic Control Council* and the *American Society of Mechanical Engineers*, and represented the *American Institute of Electrical Engineers, American Institute of Chemical Engineers, Institute of Radio Engineers*, and the *Instrument Society of America*. The trip was made in response to an invitation from the USSR Academy of Sciences and the Government Learned Technical Committee, as part of the technical exchange program agreed upon by the United States and Russia.

OCEANIA

WESTERN AUSTRALIA—The *U.S. Gypsum Company* of Chicago, Illinois, is sending representatives to Western Australia to study possibilities for the development of gypsum deposits and the large-scale production of lime and building stone. Gypsum deposits near Geraldton will be examined; also shell deposits at Hamelin Pool, pink sandstone at Northampton, and building stone at Toodyay. The company is reported to be interested "only in big projects." If a new firm is formed for local operation, it will be called *United States Gypsum (Australasia)*.

TASMANIA—*Aberfoyle Tin N.L.* at Rossarden has taken over *Storey's Creek Tin Mining Co. N.L.* on Storey's Creek, not far from Rossarden. Storey's Creek N.L. is a small but relatively rich tin-tungsten producer that has operated for many years on a most profitable basis. Operating economies are expected from the working of Aberfoyle's own mine and Storey's Creek as a unit. Aberfoyle is becoming an important investment company as well as a tin-tungsten producer for the present moves follow absorption of *North Australian Uranium Corporation N.L.* Aberfoyle also has a large holding in *Western Titanium N.L.*, an ilmenite producer.

REPUBLIC OF THE PHILIPPINES—Diamond drilling has continued to be encouraging at the property of *Palawan Quicksilver Mines* in Palawan Island, and so exploration will be greatly expanded. Mrs. Mary A. Marsman, president of *Marsman & Company* which manages Palawan, reports that at the end of 1957 ore reserves were more than adequate for five years; at the end of this year, the company is expected to show an increase in ore reserves and should then be in a position to make a reasonable calculation on probable and future ore. The firm's third kiln is in production and Mrs. Marsman has admitted that she has always envisioned six kilns for this property, paid for from earnings.

SOUTH AUSTRALIA—The state of South Australia has received about £5,500,000 from the U.S.A. and a further £3,250,000 from the United Kingdom for uranium oxide produced from the *Radium Hill* mine and Port Pirie treatment plant. A contract with the *Combined Development Agency* continues until mid-1961 and should ensure a return of £3,000,000 per year for the next three years. Recent reports are that ore reserves at Radium Hill have been extended and the mine should be in a favorable position at the end of its contract to supply part of Australia's uranium requirements for many years.

Surigao To Develop Philippine Iron Deposits

Surigao Consolidated Mining Company, important Philippine Islands base metal producer, has signed a contract with Pioneer Mining Corporation to develop an iron mine. Pioneer is the owner of more than 50 claims at Midsalip, Liargao, Zamboanga del Sur, on which two large deposits of high-grade iron ore crop out. One outcrop is 500 feet long, 160 feet wide, and is exposed over a vertical height of 180 feet by a creek. The other crops out over a length of 500 feet and a width of 50. Surigao's engineers and gelogists have started diamond drilling and mapping the deposits. Shown in the picture are Otto F. Weber, president of Surigao (seated in the middle) signing the contract with Pioneer Mining Corporation, represented by Joaquin Cuatico and Lorenzo Cuatico, president and treasurer, respectively (seated third and first from left). Standing are from left: Domingo de los Reyes of Surigao, Melchor Villanueva and Leon Samson of Pioneer, Placido Adad, treasurer, Nestorio N. Lim, examining engineer, and H. E. Heide, assistant general superintendent of Surigao.

INDONESIA—The unrest in Indonesia has had its effects upon the country's mining industry. Production in the first half of 1958 showed a decrease, in comparison with the same period of 1957. Tin production, for example, totaled 12,069.2 long tons in the first six months of 1957, and 11,163.8 long tons in the same period of 1958; 12,042.1 long tons were exported in the first half of 1957, and 10,035.4 in 1958.

NORTHERN TERRITORY — *Mount Harris Tin Mines N.L.* has made a public issue of 9,000 £5 shares in order to prospect seven tin-bearing leases 90 miles south-west of Darwin. *Commonwealth Mining Investments Ltd.* is technical manager and has selected a site for shaft-sinking. Initial reports are that the shaft is down 10 feet in good ore. Commonwealth Mining Investments has an option to subscribe for shares within six months. A nearby tin deposit, Mount Wells, has been known for some time and prospects for discovery of a sizeable orebody are considered bright. No further reports are available about the *Maranboy* testing by *United Uranium.*

WESTERN AUSTRALIA — *Central Norseman Gold Corporation N.L.* has reported a successful year with higher profit and very important additions to ore reserves in both tonnage and grade. 172,195 tons were treated for a yield of 95,722 ounces of gold, an increase of 9,480 tons but a decrease of 0.48 dwt. in recovery. Ore reserves are now 584,000 tons assaying 9.2 dwts., compared with 447,000 tons at 8.5 dwts. a year earlier. Development work during the year was concentrated on the Crown Reef. Of 13,530 feet developed on the shears, 44 percent was in payable ore averaging 13.7 dwts. over 54 inches wide. The Crown Shaft has now reached the 15 level. The company is partly owned by *Western Mining Corporation Ltd.* and partly by the public.

REPUBLIC OF THE PHILIPPINES —*Liberty Chromite Mining Corporation* has appointed *E. A. Godoy and Company* of New York as its exclusive sales agent and representative on a world-wide basis for distribution of the mining company's chromite and manganese ore production. Only exception is the high-grade metallurgical chromite ore for the Japanese market, presently handled by *Mitsubishi Shoji Kaisha* of Tokyo. Liberty Chromite operates chromite and manganese properties in Palawan and is developing chromite properties in Samar and Zambales provinces.

WESTERN AUSTRALIA—Liberalization of the Mining Act has led to an increase in large prospecting operations. Four big groups are now taking an active interest in Western Australia. *Reynolds Pacific Mines* has been granted 4,800 square miles near Wyndham to prospect for bauxite; *Rio Tinto Ltd.* has 13,000 square miles near Southern Cross to prospect for metals other than gold and iron; *Union Carbide Corporation* is prospecting for manganese near Port Hedland; and *Western Mining Corporation* has 2,000 square miles near Derby for copper and 6,250 square miles on the Darling Range escapement for bauxite.

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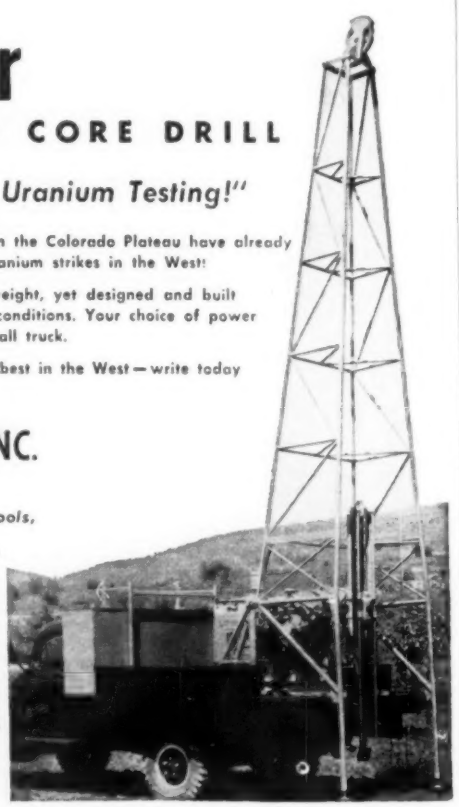

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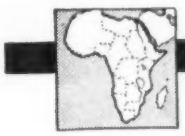

UNION OF SOUTH AFRICA—*Harmony Gold Mining Company, Ltd.*, which has been milling about 92,300 tons a month, has commissioned the third unit of its gold plant. Each unit has a rated capacity of 30,000 tons a month. Installation of the fourth unit has been started, and should be completed by the beginning of 1960. The addition of a third unit to the uranium plant, which will increase rated capacity by 40,000 tons a month to 120,000 tons, is nearing or may be completed at this writing. A third unit of 40,000 tons a month capacity is now being added to the pyrite plant, and, expected to be completed by about the second 1959 quarter, will raise the overall capacity to 120,000 tons a month. A sulphuric acid plant, with a rated acid output capacity of 120 tons a day, is being erected and should be completed after mid-1959. The No. 2 Shaft, a little more than 5,000 feet to the north of No. 3, connected with the latter workings by a twin-main haulage, and recently completed to a final depth of 5,535 feet, has been commissioned for hoisting.

FEDERATION OF RHODESIA & NYASALAND—*Nchanga Consolidated Copper Mines* has completed erection of the 400-ton L.M.G. bucket wheel excavator and 380-ton stacker at its property in the Copperbelt of Northern Rhodesia. The excavator will remove overburden from the *Nchanga* open pit, and will deliver to a movable hopper over a 11,109-foot-long belt convevor system. The conveyor, in turn, will deliver to the stacker for distribution on the waste dump.

MOROCCO—*Compagnie Chimique Marocaine* has broken ground in Casablanca for a new plant which will have a capacity for producing 60,000 tons of triple superphosphate per year.

SIERRA LEONE—A second washing mill with an annual capacity of about 500,000 tons of ore is now being completed at the *Marampa* iron mine. When completed, exports of iron ore are expected to increase to 1,500,000 tons annually. The powdered ore will be washed in the mill, and then made into concentrate for export.

TANGANYIKA—Systematic prospecting has been carried out on leases of *Uruwira Minerals Ltd.* and in the surrounding area, by a team of the *Mineral Exploration Department* of the State operated *Geological Survey.* Several holes have been drilled but these, as well as the geochemical investigation which is a part of this survey, have not indicated any unknown ore occurrences so far. The survey is expected to be completed by the end of this year.

UNION OF SOUTH AFRICA—*Winkelhaak Mines Ltd.*, now in the test milling stage preliminary to the start of regular production early next year, is believed to be conducting milling tests in standard, large-diameter, wet-running mills on run-of-mine ore.

UGANDA—*Union Corporation* of South Africa is reported to be opening up a galena prospect near the east shore of Lake George in western Uganda. The

firm is also said to be operating a small mill. C. Broadhead-Williams is in charge of operations.

SOUTH WEST AFRICA—*South African Minerals Corporation Ltd.*, which suspended manganese ore production at the end of August, is to advance underground development in order to build up additional ore reserves. Arrangements have been made until the end of the year for disposal of the ore that will become available from the development operations.

BELGIAN CONGO—The *Association of African Geological Surveys*, which met in Leopoldville during the summer, has decided to undertake the preparation of a metallogenic map. For its next meeting in 1960, a synthesis on the coastal sedimentary basins (for oil) and on copper in Africa will be prepared.

INDIA—The government of India is reported to be negotiating with Italian interests for the supply of low-grade Indian iron ore to Italy under arrangements similar to those made with Japan. This would probably include assistance in mining, transportation of ore, and development of port facilities on the west coast for shipments to Italy.

CYPRUS—The *Esperanza Copper & Sulphur Company Ltd.* is obtaining a secondary pyrite product from its concentrating plant and a stock has been accumulated amounting to 17,000 tons assaying 47 percent sulphur and 1.7 percent copper. Trial cargoes have been delivered and, if satisfactory, further shipments will be made this year.

CEYLON—Representatives of the graphite producers are seeking a reduction in the export duty to induce consuming countries to buy more graphite from Ceylon. The exports have been steadily dropping.

INDIA—The first stage in operation of a new iron ore mine at Joda, Orissa state, began with the opening of a 4,855-foot aerial tramway to carry ore from the top of a 2,000-foot hill to a railway loading station. This installation is a part of *Tata Iron & Steel Company's* 2,000,000-ton expansion program. By next year, this mine is to supply 500,000 tons annually. The tram is rated to carry 300 tons of ore per hour, and was installed by an East German firm.

MALAYA—The *Office of the Controller, Tin Control*, has notified producers that certificates of production for the Fourth quota period are valid only until December 14, 1958, not December 31. The Fifth quota period starts on January 1, 1959. It is necessary to end the fourth period earlier in the month in order to comply with Article VII—9 (c) of the International Tin Agreement, and to ensure that the Federation Permissible Export Amount is filled. The European and Asian annual assessments for the Fourth period are 902,389 piculs and 644,373 piculs, respectively.

KOREA—The *Seoul Sanyok Industrial Company* is producing alluvial gold from the Han River at the rate of 30 to 40 grams per month with a special dredge. The firm produced a total of 274 grams of alluvial gold last year and sold it to the Bank of Korea.

JAPAN—The *Geological Institute* of the *Industrial Science and Technology Agency* has started research on iron sand deposits on the sea bed off Choshi to determine if they are of commercial value. Iron sand contains titanium, and the research off Choshi is being carried out with proton magnetometers.

PAKISTAN—The field staff of the *Pakistan Geological Survey Department* is reported to have discovered gold in the rocks associated with the *Dalbandin* iron ore deposits in the Chagai district. The quantity of gold found is small but hopes of further discoveries in the area have been raised. The Geological Department will undertake a more intensive program in the area.

SAUDI ARABIA—The *United States Geological Survey* has published a geologic map of the northern Tuwayq quadrangle of the Kingdom of Saudi Arabia. This quadrangle is in the northeastern part of the country and includes the capital city of Riyad. Geologic formations range from Pre-cambrian to Quaternary. Copies are available from the U. S. Geological Survey, Washington, D.C., at $1 each. It is issued at a scale of 1:500,000 and is identified as Miscellaneous Geologic Investigations Map I-207-A.

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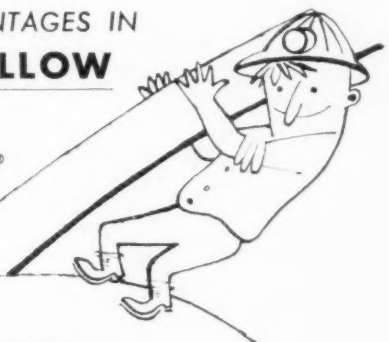

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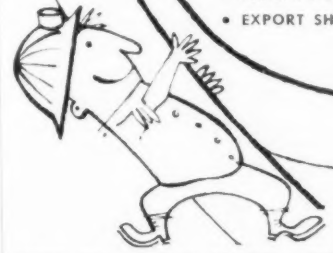

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GUATEMALA—*Bunker Hill Company* reports it is about to undertake a lead-zinc project in Guatemala jointly with *W. R. Grace and Company*.

PERU—The *Santander* mine reportedly has gone into production. *Cia. Minerales Santander, Inc.* is owned 60 percent by *St. Joseph Lead Company* and 40 percent by the *Heller-Rosenshine* interests. Investment has been about $1,800,000 to date. The ore runs about 12 percent zinc, 2½ percent lead, 0.5 percent copper, and 3 ounces silver per ton, though the surface ore, which will be mined by stripping during the first year, is expected to average higher.

BOLIVIA—*South American Placers Inc.*'s gold properties which are now under development at a cost of $3,000,000, are expected to go into production around October of next year. The parent company, *South American Gold & Platinum Company*, is predicting a profit in 1959 based on the Bolivian output. In the past year, the firm has not earned as much as in 1957, because of these factors: severe drought in Colombia which disrupted hydroelectric power sources of the company's underground mines; exchange problems between the company and Colombia; declining price of platinum which in the first half of 1958 brought the company an average of $67.00 per ounce, compared with $93.00 per ounce in the previous year.

MEXICO—*Ranas, S.A.*, currently developing the *La Maricilla* mercury mine near Queretaro, reports that it has sunk a shaft 350 meters, and is preparing to install a 20-ton rotary kiln for ore reduction. Average grade is said to be better than 1 percent, with some high grade running as high as 30 or 40 percent. Ranas, is a subsidiary of *Utex Exploration Company*, headed by Charles Steen of Moab, Utah.

SURINAM—A new company has been formed to develop the *Sarakreek Goldfields'* property on the Lawa River. *Northshore Goldfield Mines Ltd.* is the firm, with *Katima Saw Mills* and a Brigadier Westrope said to be financially interested. Sarakreek has been working the side hills along the river by means of a stationary plant. Northshore will dredge the river bottom. A 4½-foot dredge is to be shipped from *Pompiano Dredging Company* in Sierra Leone to Paramaribo, Surinam, where it will then be airlifted to the river site. (An airstrip has been built by the French government at Marafasula in French Guinea across the river.) Sarakreek will do the dredging, and will receive a 12 percent royalty from Northshore after 17¢ per cubic yard working cost is deducted. The property has been investigated for the past two years to determine whether bucket line dredging was practical, political climate favorable, etc. Now a concession headquarters has been established at Benzdorf; trees have been cleared on Rufin Creek where the dredge will start.

ARGENTINA—The National University of Cuyo has entered into an agreement with *Direccion Nacional de Mineria* for prospecting and mining of lead and copper deposits in San Juan province, in order that a minerals beneficiation plant may be established in Jachal, San Juan province. Investigations will also be made of gold and copper fields in La Rioja province, and in phosphate sediments in Mendoza province.

CUBA—The *Maria, Casualidad, Gloria, San Juan, Maximo, Gomez*, and *Ramona* mines near Mayari in Oriente Province, produced 435,038 short tons of nickel during the period from April through June, according to *Nickel Processing Corporation*. A total of 6,215 tons were exported.

COLOMBIA—During the first half of 1958, *Pato Consolidated Gold Dredging Ltd.* recovered 75,457 ounces of fine gold from 12,343,000 cubic yards dredged, compared to 49,814 ounces from 12,395,000 cubic yards in 1957. The increased production was recovered by the No. 4 dredge in a narrow stretch of river through which it was necessary to pass on its course to assigned reserves 10 miles down stream. It had previously been considered impractical to dredge this part of the river, but excellent values were recovered. Production is expected to drop during the last half of the year when the No. 4 dredge will be digging flotation and the No. 5 dredge will be out of production undergoing repairs, the No. 6 dredge has been closed. An exploration program for alluvial gold and base metals is planned in Surinam and Venezuela during the remainder of the year.

CHILE—Recovery of copper at *Braden Copper Company's* operations near Sewell has been increased two percent with addition of new crushing and flotation equipment. In the flotation plant, eight sections of old machines were replaced with Fagergren cells. Each section contains 48 cells, arranged in four rows of 12 cells each. The cells are 62 inches in size, with 66-inch mechanisms, and are mounted in cement tanks with stainless steel launders. New Symons crushers were installed in the crushing plant.

PANAMA—*Rosario Exploration Company* has shut down operations in Panama. In 1957, Rosario reportedly was interested in development of manganese deposits in the Rio Boqueron area of Colon Province.

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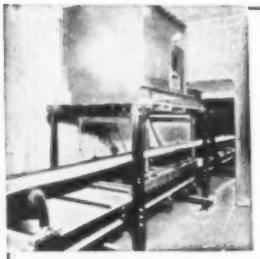

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NORTH AMERICA

SASKATCHEWAN—*Kelsey Lake Development Company* is undertaking a large-scale drilling program on 105 claims obtained under a work-purchase option from *Irex Iron Mines Ltd.* Material previously drilled by Irex and tested by *Pickands Mather & Co.* and *Noranda Mines*, showed an average grade of 30.9 percent iron with minimum amounts of impurities. Kelsey Lake will spend $200,000 on on its drill program. It may buy the property from Irex within two years for $1,500,000. Kelsey is a private company financed by Toronto interests. Irex is controlled by a group which includes *Teck-Hughes Gold Mines*, *Noranda Mines*, and *Crowpat Minerals*.

QUEBEC—*Mattagami Syndicate* is reported to have formed *Watson Lake Mines Ltd.* to develop a large group of claims adjacent to the original ore discovery the syndicate made earlier this year. The syndicate, composed of *Area Mines Ltd.*, *Dome Mines Ltd.*, *Highland-Bell Ltd.*, *Iso Uranium Mines Ltd.*, *Leitch Gold Mines Ltd.*, and *Teck-Hughes Gold Mines Ltd.*, optioned its first discovery ground to *Noranda Mines*, *McIntyre Porcupine Mines*, and *Canadian Exploration Ltd.* Five diamond drills are presently being used to block out ore on that property.

ALASKA—*Humble Oil and Refining Company* is said to have discovered and filed claims on iron ore-bearing property in the Dillingham area. The company's main interest in Alaska until now has been in finding oil. Drilling during the summer resulted in the ore discovery, and a number of placer and lode claims have been filed. Assaying and testing of ore samples will be continued during the winter months, according to reports.

BRITISH COLUMBIA—*Phelps Dodge Corporation of Canada Ltd.* has decided to terminate its agreement with *Jericho Mines* for development of 1,000 claims in Highland Valley. Phelps Dodge has been exploring the property for two years. Jericho will proceed alone, at least for a while.

QUEBEC—The Chute-des-Passes hydroelectric development 150 miles north of the Saguenay River is nearing its final phase. Excavation of the six-mile long water supply tunnel through solid rock, and another nearby two-mile tunnel, as well as the huge cavern for the 1,000,000-hp. power house, have been completed. Blasting of the intake "plug" is scheduled for next spring. Started in September 1956, the project is scheduled for completion in March 1960. With this added facility, the Saguenay hydroelectric system will have a total capacity of 3,580,000 horsepower. Owned by the *Aluminium Company of Canada*, the increased power will be used for the *Arvida* aluminum smelter.

BRITISH COLUMBIA—*Boyles Bros. Drilling Company Ltd.*, world-wide diamond drilling contractors and manufacturers of drill equipment, has entered into a Canadian mining operation with *Anglo-American Corporation* and *De Beers* organization of the Union of South Africa. A new company has been formed in which Boyles has a 20 percent interest.

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It will be called *Hard Metals (Canada) Ltd.*

ONTARIO—*Riobec Mines* has acquired 18 gold claims in the Red Lake mining area. The property is located 2½ miles from *McKenzie Red Lake Mines* and four miles from *Cochenour-Willans Gold Mines*. Previous exploration work has revealed gold values in a white quartz vein on one of the claims. A crew is now undertaking development work.

BRITISH COLUMBIA—*Vanex Minerals* is diamond drilling its copper property in the Highland Valley, about 14 miles east of *Bethlehem Copper Corporation's* property. A geophysical survey has already indicated a magnetic anomaly about 4,000 feet long and about 1,500 feet wide. The present program will involve a minimum of six vertical holes to be drilled to 750 feet.

ONTARIO—A molybdenite showing has been uncovered by *Lindsay Explorations Ltd.* in trench blasting on the firm's property in the Thunder Bay area. The showing is the highest grade yet found on the 10-claim prospect. The main dike has been exposed almost continuously for 1,200 feet in the center of an area of pegmatite dikes which has been bulldozed to partially remove the overburden.

ALASKA—The *U.S. Steel Corporation* subsidiary, *Columbia Iron Mining Company*, is continuing its exploration of the *Klukwan* iron deposit near Haines, on which it holds an option. The property is held by *Klukwan Iron Ore Corporation*, a subsidiary of *Quebec Metallurgical Industries Inc.* Other companies are reported to be interested in iron ore deposits in the vicinity of Bradfield Canal and in the area near Ketchikan.

BRITISH COLUMBIA—*Canadian Exploration Ltd.* has suspended tungsten production near Salmo following expiration of a contract under which the United States bought output at about $60.00 a unit. The world price for the metal is only about $11.00 a unit. The firm also produces lead and zinc at its Salmo holdings. G. A. Gordin is manager.

YUKON TERRITORY—Shareholders in *Canadian Northwest Mines & Oils Ltd.* have approved the sale of the company's *Keno Hill* property in the Yukon Territory to *United Keno Hill Mines* for $300,000. The sale includes the interest of *Yukeno Mines Ltd.* in the company's mill, and the interest of Yukeno Mines in five mining claims or leases in the area. Of the $300,000 Canadian Northwest would retain $200,000 and Yukeno would receive $100,000. Both firms have agreed to pay *Bibis Yukon Mines Ltd.* $10,000 to commute certain royalties.

ALASKA—The *Havenstrite* gold mine, which was purchased by Jack Bullock of Kotzebue earlier this year, is being worked by Fred Parker and Jack Raymond. Both were associated with the *P. R. & H. Company* in the Circle district. The Havenstrite gold mine and properties are located at Candle on the Seward Peninsula.

BRITISH COLUMBIA—In the Cranbrook district's Wild Horse Canyon, scene of a gold rush in the 1860's, Charles F. Gorse and associates have started placer mining with a dredge and washing equipment. They hope to recover silver and platinum along with gold.

NORTHWEST TERRITORIES—*Salmita Consolidated* reports the drilling and blasting operations on the southern portion of its property at Matthews Lake has opened up a blue quartz vein with considerable visible gold. This is about 1,000 feet from the *Taurcanis Mines Ltd.* boundary where that firm reports it is drifting in ore on two levels of its *MacKay Lake* property.

ONTARIO—*Cadamet Mines Ltd.* has been formed by the merger of four mining companies. Involved in the amalgamation are: *Bouscadillac Gold Mines, Federal Kirkland Mining Company, Graham Bousquet Gold Mines*, and *St. Michael Uranium Mines*. The new firm will have an authorized capitalization of 7,500,000 shares, and will hold several properties, namely, uranium prospects in Beaverlodge area of northern Saskatchewan; property in Highland Valley, British Columbia now being worked under contract by *Noranda Exploration Company*; a Columbium property in the Oka area of Quebec; a copper prospect in Baldwin and Porter townships of northern Ontario; and gold prospects in the Kirkland Lake camp of northern Ontario.

BRITISH COLUMBIA—*Sheep Creek Mines Ltd.* reports it has been able to "break even" at its *Mineral King* lead-zinc mine near Invermere, despite the difficult operating conditions. A high-grade ore discovery made recently turned out to be an irregular offshoot of the main ore body. A second intersection was in virgin ground and the company plans to drive to this. Negotiations have been resumed for acquisition of a Mexican property.

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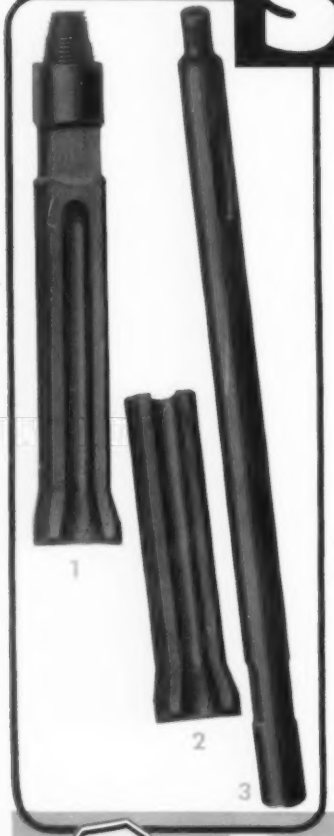

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Bechtel Corp. .....April 64, Sept 102
Beers, Roland F., Inc. ..Aug 63, Sept 99***
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Black Bear Silver-Lead Mines Co. ..March 78, Oct 69, Dec 61
Black Hills Development Co. .....Aug 65
Black Rock Mining Corp. .....Oct 65
Black Sands Mining Corp. .....April 67
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Blue Jester Mines, Inc. .....May 77
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Bonanza Consolidated Mining Co. ....Feb 78, March 81
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Bristol Silver Mines Co. ....Jan 85, Oct 66, Nov 67
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Coeur d'Alene Syndicate Mining Co. ..Oct 69, Dec 61
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Crescent Mining Co. .....Dec 58
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Crucible Steel Co. .....Jan 78
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Cyprus Mines Corp. .....Jan 92, Mar 98, April 71, May 77, July 67, Aug 77, Sept 113
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Globe Mining Co. ..May 84, June 74, Oct 62
Golconda Lead Mines .....Feb 73, April 67
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Granite City Steel Co. Mar 73, May 73, Nov 72
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* Appears in World Mining.
** Photograph.
*** Map.

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Kaiser Aluminum & Chemical Co.
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Northwest Refining & Chemical Co. ...April 69
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Part & Cross Mining Co. ..... Sept 103
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Ramapa Mountain Iron Mines ..... April 66
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° Appears in World Mining.
°° Photograph.
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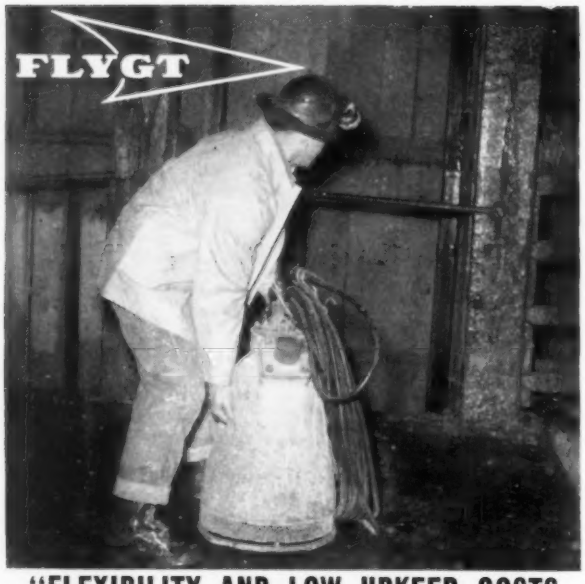

"FLEXIBILITY AND LOW UPKEEP COSTS MAKE FLYGT PUMPS AN ADVANTAGE"

reports LUCKY FRIDAY SILVER-LEAD MINES CO.

While working a 750' shaft-deepening project from the 2300 to 3050 foot level, the Lucky Friday Mine ran into a dewatering problem which required pumping out an average of 150 to 175 GPM. At the start of sinking operations, air pumps were used, but because of periodic extra volume water seepage and excessive repair and maintenance costs, the air pumps were abandoned in favor of Flygt Model B-80L Submersible Electric Pumps.

In the pumping cycle, a Flygt Pump was lowered to the shaft bottom as soon after each blast as possible, and the water was lifted to relay pumps at a higher level, with heads up to 80 feet. The Mine Engineer, in a paper on the operation delivered before the Northwest Mining Convention, said of the Flygt pumping method: "Although the initial cost seemed high at first, the absence of expensive upkeep and the efficient pumping performance justified the investment. The quiet operation of the Flygt was a decided relief after listening to the siren-like air pumps. The Flygt Electric Pump was a distinct improvement over any type of air pump where large volumes of water had to be moved from the shaft bottom. It was low in upkeep cost and its unusual flexibility made it a definite advantage."

Since shaft sinking was completed, two Flygt Model B-80L Pumps now have become a part of the Lucky Friday's permanent mine pumping installation. In service since October 1956, they still are performing with a maximum of efficiency and a minimum of upkeep.

Flygt centrifugal Pumps range in size from 1½"-85 GPM capacity to 8"-3,000 GPM capacity. Head capacities range up to 210 feet. Weights range from 80 to 1200 pounds.

CHECK THESE FLYGT FEATURES

- ✓ Electric
- ✓ Resistant to Salt Water
- ✓ Submersible
- ✓ Easy to Handle
- ✓ Low Maintenance Costs
- ✓ Will Pump High Amount of Solids
- ✓ Heavy Duty
- ✓ Continuous Duty
- ✓ Runs Dry Without Damage
- ✓ Quick and Easy to Service
- ✓ No Installation Costs
- ✓ No Priming Needed

FLYGT

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Stanco MFGS. & SALES INC.

1666 Ninth St.
(Corner of Olympic & Ninth)
Santa Monica, California.

EAST OF THE MISSISSIPPI:

STENBERG MANUFACTURING CORPORATION

Hoosick Falls, N.Y.

U.S.A. Metal & Mineral Prices

METALS

November 14, 1958

COPPER: **Electrolytic.** Delivered F.o.b. cars, Valley basis (pound) 29.00¢
Lake. Delivered, destinations, USA 29.00¢
Foreign. Copper, Valley basis 29.00¢
Custom 30.00¢
LEAD: **Common Grade.** New York (Per pound) 13.00¢
Tri-State Concentrate, 80% lead, per short ton $156.12
ZINC: **Prime Western:** F.o.b. E. St. Louis (Per pound) 11.50¢
Prime Western: Delivered, New York 12.00¢
Tri-State Concentrate, 60% zinc, per ton $68.00
ALUMINUM: **Primary 30 Pound Ingots (99% plus)** (Per pound) 26.80¢
ANTIMONY: **Lone Star Brand. F.o.b. Laredo, in bulk** (Per pound) 29.50¢
BISMUTH: (In ton lots) price per pound $2.25
CADMIUM: **Sticks and bars.** 1 to 5 ton lots (Price per pound) $1.45
COBALT: **97.99%,** keg of 550 pounds (Price per pound) $2.00
COLUMBIUM: **Powder** Nom., per pound $55.00-$85.00
GERMANIUM: **Germanium:** dioxide, high purity, gram 18.50¢
LITHIUM: **98%** (per pound) $11.00-$14.00
MAGNESIUM: **Ingots (98.8%)** F.o.b. Valasco, Texas, per pound 36.00¢
MERCURY: **Flasks.** Small lots, New York $230.00-$233.00
NICKEL: **"F" Ingots (5 pounds).** F.o.b. Port Colbourne, Ontario 75.50¢
PLUTONIUM: To July 1, 1962 AEC will pay $30.00 to $40.00 per gram depending on plutonium 240 content. July 1, 1962 to June 30, 1963, per gram $30.00
SELENIUM: **99.5%,** per pound $7.00
THORIUM: per kilogram $43.00
TIN: **Grade A Brands.** New York (Per pound) Prompt delivery 99.75¢
TITANIUM: **99.3%** - Grade "A" Sponge (Per pound) $1.70-$1.82
URANIUM: **Rod** (0.790 U-235) $16.00 Per Pound; Foil $16.75
U-235: **Nominal** (Per pound) $7,725
GOLD: **United States Treasury Price** $35.00 per ounce
SILVER: **Newly mined domestic.** U.S. Treasury price per ounce 90.5¢
Foreign Handy Harmon 90.1¢
PLATINUM: Per Ounce $57.00-$60.00
ZIRCONIUM: **Sponge,** Per pound, Reactor Grade $5.00

ORES AND CONCENTRATES

BERYLLIUM ORE: **10 to 12% BeO.** F.o.b. mine, Colorado $46.00 per unit Small lot purchases at Custer, S. D., Spruce Pine, N. C., and Franklin, N. H. Visual inspection at $400.00 per short ton or by assaying at: 8.0 to 8.9% BeO, $40 per unit; 9.0 to 9.9%, $45; over 10.0%, $48.00.
CHROME ORE: F.o.b. railroad cars eastern seaports. Dry long tons
African (Rhodesian). 48% CR_2O_3. 3 to 1 Ratio $45.00-$47.00
African (Transvaal). 48% Cr_2O_3. No ratio $31.00-$33.00
Turkish, 48% Cr_2O_3, 3 to 1 chrome-iron ratio Nominal $52.00
U.S. Government ore purchase depot Grants Pass, Oregon, Base price, lumpy ore, $115.00; fines and concentrates $110.00 for 48% Cr_2O_3 and a 3 to 1 chromium-iron ratio. Premiums for higher grade ore and for a ratio up to 3.5 to 1. Penalties for grades down to 42% Cr_2O_3. Buying suspended, quota filled.
COLUMBIUM-TANTALUM ORE: At United States small lot beryl purchase depots. $3.40 per pound contained combined pentoxides in 50% ore. Includes 100% bonus. (Government stopped buying temporarily May 12, 1957) Per Pound Pentoxide $1.15
IRON ORE: **Lake Superior. Per gross ton Lower Lake Ports**
Mesabi, Non Bessemer, 51.5% Fe $11.45
Mesabi, Bessemer, 51.5% Fe $11.60
Old Range Non Bessemer $11.70
Old Range Bessemer $11.85
Swedish, Atlantic Ports, 60 to 68% Fe Contracts, Per Unit. 26.00¢
MANGANESE ORE: **Metallurgical grade.** 48 to 50% Mn. Long ton unit $1.05-$1.10
Metallurgical grade. 46 to 48% Mn. Long ton unit. $1.00-$1.05
Metallurgical grade. 44 to 46% Mn. Long ton unit $0.95-$1.00
Domestic U.S. Government purchasing depots: Butte, Mont.; (black and pink ores) base price of $4.87 per long dry ton of 18% manganese ore. Phillipsburg, Mont.; base $6.43 per long ton of 15% manganese ore. Small lot program f.o.b. railroad cars, minimum 40%. Base (48%) $2.30 per unit with premiums and penalties.
MOLYBDENITE CONCENTRATE: **90% MoS_2 F.o.b.** Climax, Colorado. Per pound Mo, plus container cost $1.25
TUNGSTEN CONCENTRATE: **Domestic.** 60% WO_3 Per short ton unit $12.00
Foreign. 65% WO, Per short ton unit (Scheelite) Nominal $9.00
Foreign: South American, Spanish, Portuguese Nominal $8.00
URANIUM ORE: F.o.b. purchase depot or company mill in accordance with AEC schedules and company buying contracts. Basic price is $1.50 per pound of U_3O_8 in ore assaying 0.10 percent. For each additional 0.01 add 20¢. Subject to development allowance, premiums, penalties where applicable.

NON-METALLIC MINERALS

BENTONITE: **Minus-200-mesh.** F.o.b. Wyoming. Per ton, carload lots $12.50
Oil Well grade. Packed in 100 pound paper bags $14.00
BORON: Technical grade F.o.b. Boron, California. Per ton $47.50
FLUORSPAR: **Metallurgical grade.** 72.5 % effective CaF_2 content per short ton F.o.b. Illinois-Kentucky mines $36.00-$40.00
Mexican. 70% F.o.b. border $26.00-$27.00
Acid Grade. 97% CaF_2, Bulk, F.o.b. mine $48.00-$52.00
Government buying F.o.b. producer's shipping point: 60% Illinois-Kentucky, $34.50 per ton, others $28.50; 70% Ill.-Ken. $38.50, others $32.50.
PERLITE: **Crude:** F.o.b. mine per short ton $3.00 to $5.00
Plaster grades. Crushed and sized. F.o.b. plants $7.00 to $9.00
SULPHUR: Long ton, F.o.b. Hoskins Mound, Texas $25.00
Export $24.00-$25.00

LONDON METAL AND MINERAL PRICES

November 14, 1958

			Per Long Ton	USA Equivalent cents per pound[1]
COPPER:	Electrolytic spot	£257	0s 0d	32.13¢
LEAD:	Refined 99%	£ 76	12s 6d	9.58¢
ZINC:	Virgin, 98%	£ 75	0s 0d	9.38¢
ALUMINUM:	Ingot, 95.5%	£180	0s 0d	22.50¢
ANTIMONY:	Regulus, 99.6%	£197	10s 0d	22.69¢
TIN:	Standard, 99.75%	£763	10s 0d	95.44¢
TUNGSTEN:	Long ton unit	82s		$11.48

Quotations on metals and certain ores through the courtesy of *American Metal Market, New York, N. Y.*

PUSH IN

FRESH AIR

PULL OUT

FOULED AIR

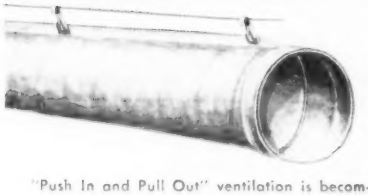
WITH

A B C

NEOLON FLEXIBLE VENTILATION TUBING

AND

WIRE REINFORCED NEOLON TUBING



"Push In and Pull Out" ventilation is becoming increasingly popular in mines because of its effectiveness. A B C Tubing of **NEOLON** —the amazing, tough, rip-proof neoprene coated nylon fabric—gives longer service with maximum economy. Regular **NEOLON** Flexible Tubing for blowing in fresh air and Wire Reinforced **NEOLON** Tubing for exhausting fouled air. All standard diameters, in any length. Both types easy to couple and choice of "S" hook or Rivet Hook suspension. A B C Tubing is the most complete line. Send for Catalog 158.

A B C AMERICAN BRATTICE CLOTH CORP.

230 S. Buffalo St., Warsaw, Indiana

Kiruna Mine

Continued from page 45

superior, both in price and maintenance cost. The apron feeder was by far the most expensive, and is now replaced by belt feeder. The so-called Joy feeder has given quite good results.

The major disadvantage of the belt feeder is the risk that a drill steel or sharp edged wearing plate may be in the ore and rip the belt. For this reason, the feeder has been mounted on wheels and an overhead 12-ton crane can quickly remove the feeder and replace it with a spare of which there is one on each level. The feeder can then be repaired or the belt replaced or vulcanized and set aside as spare.

Ponductor Controls Hoisting

Fully automatic skip loading and hoisting is controlled by a ponductor which is an automatic electrical weighing device. The lower part of the measuring pocket rests on a lever which moves in accordance with the weight of the pocket and ore. Lever movement exerts a torque on a tube formed shaft fixed to a frame. One of the ponductor's windings is fed a regular low tension current. A current is induced in the second winding proportional to the torsional stress imparted to the shaft. The induced current actuates sensitive relays to close and open switches. Thus, when the pocket has been filled with determined weight of ore, the ponductor stops the bin feeder. Then, when the empty skip is in the loading position, the measuring pocket is automatically opened to fill the skip. The pocket door is then closed by the ponductor-produced current change, the hoist motor started, and the feeder set in motion to refill the pocket.

The simple ponductor operates at ±1.0 percent accuracy in weighing the ore. It has the advantage of no vertical movement of the measuring pocket to set up frictional forces on the guide shoes in the pocket which could influence the measuring accuracy.

Kiruna's open pit and underground mining, underground crushing, and hoisting have now been described. The use of rubber in the concentrator was described by Mr. Kjelgaard in the January 1958 issue, pages 49 to 51, "Kiruna Proves It Takes a Lot of Hard Sharp Heavy Iron Ore To Wear Out Rubber Chutes." A complete report on the concentrator written exclusively for MINING WORLD by Mr. Kjelgaard will appear in an early issue.

THE END

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FIFTEEN SIZES

Model	Size	Weight
2A	26"	480#
2A	30"	510#
2A	34"	550#
AB	36"	775#
AB	42"	850#
AB	48"	960#
AB	54"	1080#
3B	36"	1400#
3B	42"	1540#
3B	48"	1660#
3C	60"	2590#
3D	48"	2030#
3D	60"	2790#
3D	72"	3910#
3D	84"	4000#

Larger sizes also available. Scrapers are a specialty with us. Write today regarding your scraping problems. Send for New Bulletin giving specifications, complete information.

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1—15' x 20' Circular Steel Ore **Bin**
1—Size 3HXB Sutor Bilt **Blower**, 7½ HP Motor
2—TM6 Coppus Ventair **Blowers**
1—8 compartment Deco Hydraulic **Classifier**
1—4' x 15' Dorrco Duplex Rake **Classifier**, Model DSFM
1—6' x 6' **Conditioner** Steel Tank, 10 HP TEFC Motor
1—18" x 175' Link Belt **Conveyor**, all steel frame
1—18" x 155' Link Belt **Conveyor**, all steel frame
1—Size FE1049 Equipment Engineers **Cyclone**
1—Size 50 Kue Ken **Jaw Crusher**, 25 HP Motor
1—2' Std. Symons Cone **Crusher**, 50 HP Motor
1—18" x 17' long Denver Rotary **Dryer**, oil fired
2—Size 4B-3 Norblo Bag Type **Dust Collector**, Portable
1—36" x 8' 4" Link Belt Apron **Feeder**, 3 HP drive
1—18" x 20½" Link Belt **Ore Feeder**
1—8 Cell Gallagher **Flotation Machine**, 36", 7½ HP Motors
1—26" x 36" Bendelari Simplex Mineral **Jig**
1—4' x 10' Marcy Rod **Mill**, 75 HP Motor
1—2" Deco Diaphragm **Pump**, Adj. Stroke
1—1" Wilfley **Sand Pump**, Model K, 2 HP Motor
1—2" Wemco **Sand Pump**, Rubber Lined, 7½ HP Motor
5—2" Wilfley **Sand Pumps**, Rubber Lined, 5 HP Motor
1—3" Wilfley **Sand Pump**, Rubber Lined, 15 HP Motor
1—3" Gallagher Vac-Seal **Sand Pump**, Rubber Lined, 15 HP Motor
1—4" Gallagher Vac-Seal **Sand Pump**, Rubber Lined, 30 HP Motor
1—4" Wemco **Sand Pump**, Rubber Lined, 30 HP Motor
1—5' x 7' Link Belt **Vib. Screen**, Single Deck, 5 HP
1—3' x 6' Link Belt **Vib. Screen**, Single Deck
1—3' x 6' Allis Chalmers "Aerovibe" Vib. **Screen**, Single Deck
6—4' x 5' Tyler "Hummer" **Screens**, Single Deck, 220 V
1—12" x 16½" long, 3 unit Wemco Dry Magnetic **Separator**
12—2½ Deister diagonal deck Concentrating **Tables**
4—#4 Deister diagonal deck Concentrating **Tables**
1—6' x 11' Wemco Lowhead **Thickener**, Steel Tank
1—75' x 120' All Steel Mill Building, Excellent

Balances
1—Ainsworth Pulp Balance
1—Ainsworth Analytical Balance
1—Welch Scientific Pulp Balance
1—BKH Analytical Balance, wood case

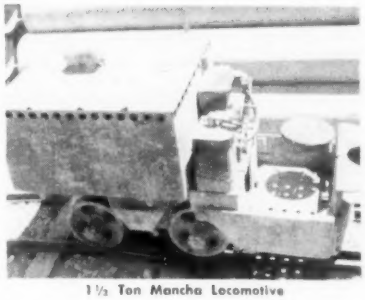
Bin
1—15 Ton Hopper Type Bin, Size 6' x 10' x 5' high

Blowers
1—Size 4 Victor Acme Positive Pressure
1—15" La Del Axial Flow, 1½ HP Motor, 440 volt
1—24" Sturtevant Axial Flow, 5 HP Motor, 440 volt
4—TM8 Coppus Ventair, 15 HP Motor, 440 volt

Boiler
1—10 HP Kewanee Boiler, 15 lb. oil fired, complete

Bucket, Scraper
6—24", 26" Model 2A Pacific
1—34", Model 2A Pacific

Bucking Board & Muller
1—30" x 36" Bucking Board & Muller



1½ Ton Mancha Locomotive

Cars, Mine Ore
18—18 cu. ft. C. S. Card, Type F-18, 18" ga.
11—20 cu. ft. C. S. Card, Type F-20, 18" ga.

Compressors, Air
1—285 cfm Gardner Denver, Model WBH
2—500 cfm Gardner Denver, Model HAL, 100 HP Motors, 440 volt
1—625 cfm Ingersoll-Rand, Model XCB, 125 HP Motor, 2300 V
1—1000 cfm Chicago Pneumatic, Model 0CB-LA, 200 HP Motor, 440 V

Copy Machine
1—Bruning Copy Flex, Model 153M, 24" wide

Crusher
1—2½" x 4" DFC Lab. Jaw Crusher, 2 HP Motor

Drifters
2—DA35 Ingersoll-Rand, air feed motors

Diamond Drill Bits
24—Size EX Christensen Diamond Products, NEW
6—Size AX Christensen Diamond Products, NEW

Drill
1—H.S. 15 Sullivan, air operated W puller

Feeder
1—24" x 48" Wemco Belt Ore Feeder, less motor

Furnace
1—IF2 Ingersoll-Rand Steel, oil fired
1—27F Ingersoll-Rand Steel Furnace, oil fired
1—BKH Electric Assay Furnace, 13" x 15" x 12"

Generator
1—100 KW Caterpillar Diesel Generator, D-13,000, 440 volt
1—45 KW General Electric 440 V, AC Generator

Gumming Machine
1—72" Cap. Covell Saw Gumming Machine, No. SF

Hoist, Slushers & Tuggers
3—FF211 Joy Slusher, air
7—S211 Joy Slusher, air
1—F211 Sullivan Slusher, air
2—A4NN0I Ingersoll-Rand Slusher, air
6—HKE Gardner Denver Slusher, air
1—HU Ingersoll-Rand Tugger, air
1—HK Gardner Denver Tugger, air
4—D6U Ingersoll-Rand Tugger, air
1—HKL Gardner Denver Tugger, air
1—15ML20 Ingersoll-Rand Slusher, 440 V
1—A5XN0H Ingersoll-Rand Slusher, Air

Hoists, Mine Shaft
2—400 HP Coeur d'Alene Hardware, Single Drum 4000# pull, 440 V Electrics, Excellent

Lamps, Cap
33—R4 Edison Electric Cap Lamps with racks and M-G Set, 440 V

Lathe
1—16" x 52" long Bradford Machine Lathe, Lotz Pulley

Locomotives, Battery
8—1½ Ton Mancha "Little Trammer," 18" ga. W/Batteries, Charging Sets
1—3½ Ton Mancha Titan AX, 18" ga. W/Batteries, Charging Sets

Mucking Machines
5—12B Eimco Mucking Machines, 18" ga.
5—12B Eimco Mucking Machines, Late Model, 24" ga.
1—6B9 Gardner Denver Mucking Machine, 18" ga.

Pipe Thawer
1—20 KVA Pipe Thawing Transformer, single phase

Pipe Threader
1—Model A Beaver Portable, 115 volt Excellent

Pneumators
2—24 cu. ft. MSA Pneumators Complete, Brand New

Pump, Deepwell
2—6" Johnston Deepwell Turbine Pump, 40 HP

Pump, Centrifugal
1—5½ MRV-20 Ingersoll-Rand, 440 V
1—2MRV10 Ingersoll-Rand, 220/440 V
1—20RV5 Ingersoll-Rand, 220/440 V

Pulverizer
1—Braun UA Pulverizer, 2 HP, Integral Motor, Excellent

Rail
1137 Tons—20# Mine Rail
7 Tons—#40 Mine Rail

Rectifier
1—5 KW General Electric Metallic Rectifier, 440 V **Brand New**

Saw
1—No. 500 Ingersoll-Rand Cut-off Saw, Air

Screens
1—18" x 3' Denver Dillon Vib. screen, 1 deck, less motor

Sharpener
1—Model DS2 Gardner Denver, Steel Sharpener

Sheaves
38—6" Skookum Sheaves, Roller Bearing
3—8" Skookum Sheaves, Roller Bearing

Telephones
1—Graybar Aluminum Case, Excellent

Transits, Engineers
1—17" Berger Level W/case and Tripod
1—7" Ainsworth W/case and Tripod
1—11" Berger W/case and Tripod
1—8½" Gurley W/case and Tripod

Welders
1—200 Amp G.E. Arc Welder, 220/440 volt
2—300 Amp Lincoln Shield Arc Welder, 220/440 volt

Wrench, Air
5—Model 534 Ingersoll-Rand Impact Air Power, 1"

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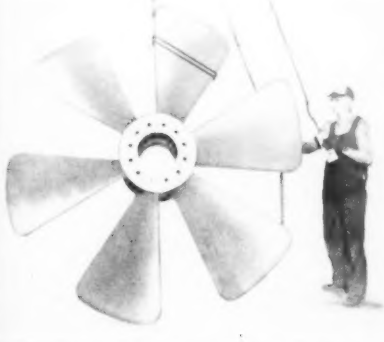

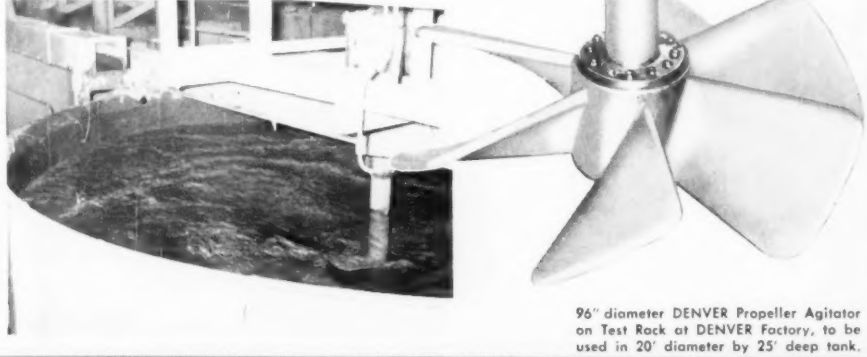

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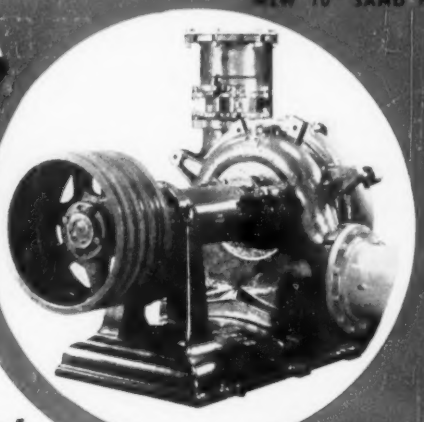

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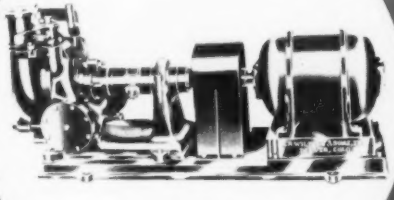
Belt driven, overhead V-belt driven and direct driven Wilfley Model "K" pumps are available in 1" to 10" discharge sizes with capacities from 10 to 4000 GPM. These famous pumps may be fitted with **interchangeable** wear parts of electric furnace alloy white iron, Ni-Hard type metal, special application alloys, or rubber-covered. Write or wire for complete details.

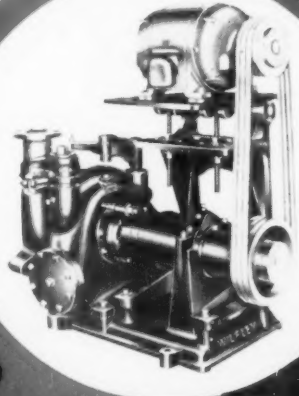
DIRECT DRIVEN SAND PUMP



To give you **maximum economy in solids** pumping every Wilfley installation is **job engineered.**

Specify Wilfley Sand Pumps for Maintained High Efficiency, Low Maintenance Costs, Continuous, Trouble-Free Operation, Long Pump Life and Quick, Easy Replacement of Parts.

OVERHEAD V-BELT DRIVEN SAND PUMP



WILFLEY ACID PUMPS
"COMPANIONS IN ECONOMICAL OPERATION"
WILFLEY SAND PUMPS

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